

Vol. XII

No. 3

DISSERTATION

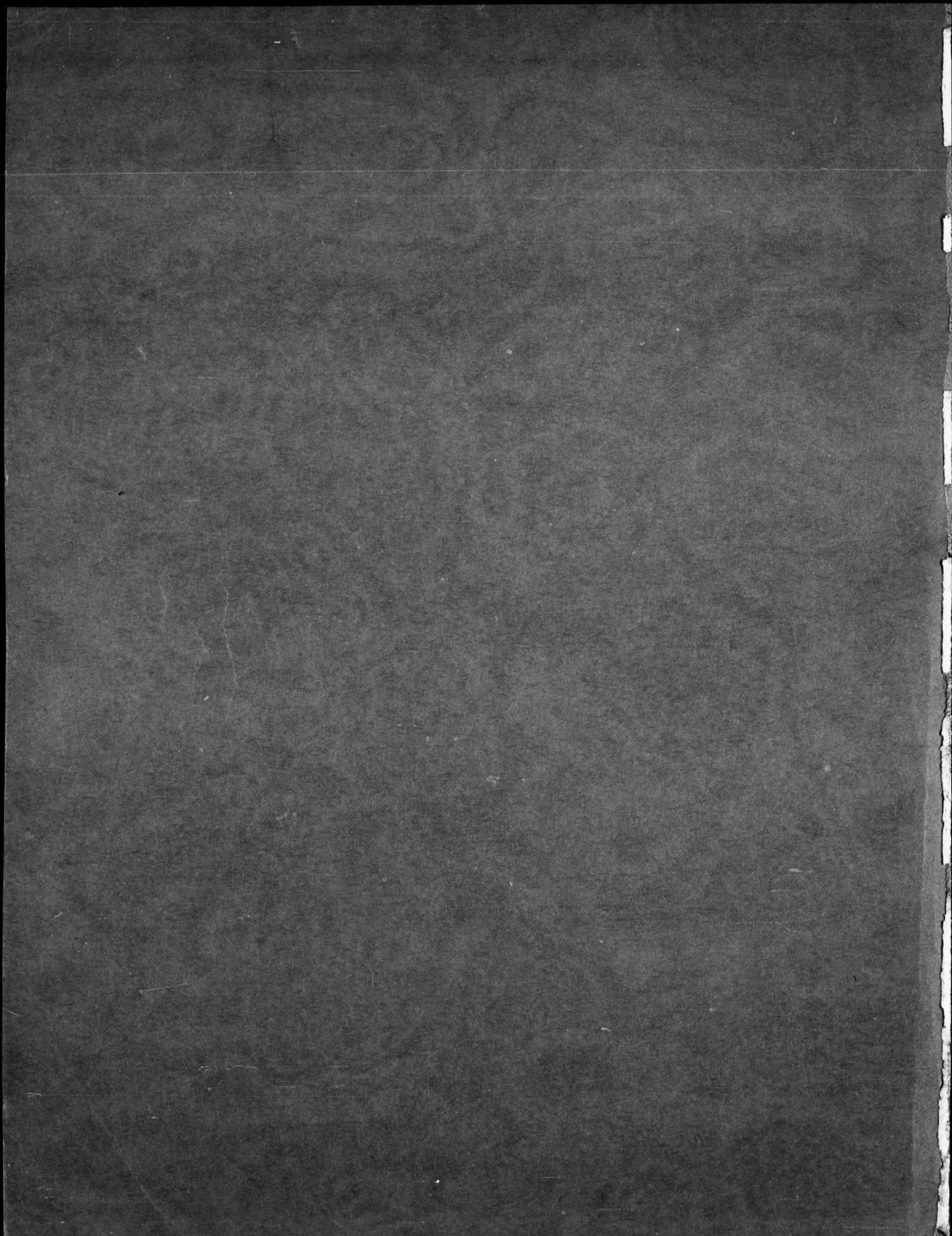
ABSTRACTS

(formerly MICROFILM ABSTRACTS)

*A GUIDE TO DISSERTATIONS AND
MONOGRAPHS AVAILABLE IN MICROFORM*

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DISSERTATION

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*A GUIDE TO DISSERTATIONS AND
MONOGRAPHS AVAILABLE IN MICROFORM*

UNIVERSITY MICROFILMS
ANN ARBOR, MICHIGAN: 1952

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INTRODUCTION

With a view toward a more accurate and descriptive title, the name MICROFILM ABSTRACTS is being changed to DISSERTATION ABSTRACTS with this issue. Another change also being instituted at this time is a change in format from 5 1/2 x 8 1/2 inches to 8 1/2 x 11 inches, since with this larger size less shelf space will be required in libraries. There will be six issues per year, one containing cumulative author and subject indexes for the year. The free distribution to selected libraries has been discontinued in favor of a straight subscription basis.

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THE FIRST PART OF THE BOOK IS A HISTORY OF THE
CITY OF NEW YORK FROM ITS FOUNDATION TO THE
PRESENT DAY. IT IS A HISTORY OF THE CITY
AS IT HAS BEEN AND AS IT IS.

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AGRICULTURE

METHODS OF BREEDING INTERMEDIATE WHEATGRASS, *AGROPYRON INTERMEDIUM* (HOST.) BEAUV.

(Publication No. 3649)

David Henry Heinrichs, Ph.D.
University of Minnesota, 1952

Studies were conducted on the relative seed setting ability of 34 selected clones of intermediate wheatgrass (*Agropyron intermedium* (Host.) Beauv.) under open-pollination and when crossed and selfed under paper bags, in both field and greenhouse. In addition, the variation between characters of clones and their open-pollinated and polycross progenies was studied in replicated trials in the field. Association between characters, parent clones and progenies, and between various characters of the clonal lines was studied by means of correlation coefficients. Correlation coefficients and mean squares were also used as a measure of character heritability.

Clones differed considerably in seed setting ability. Six out of 34 clones were extremely infertile, setting only an occasional seed under open-pollination. All clones were self-infertile, the average self seed set in the field was only 1.5 per cent of that set under open-pollination. A considerable quantity of seed was obtained when heads from different plants were isolated in one bag indicating that the bags themselves had very little bearing on the low self seed set. The quantity of aborted pollen was rather great in a number of lines but the association between amount of aborted pollen and female infertility was low. The results indicate the probable existence of genetic factors for sterility and possible abnormal meiotic behavior of the chromosomes.

The F test showed that there were highly significant differences between lines for every character studied. These differences were apparent in the seed progenies as well as in the clonal lines. The characters studied were: fall vigor, spring vigor, foliage color, solidness of stem, creeping rootedness, plant density, fineness of stem, leaf pubescence, head pubescence, hay yield, seed yield, height, date of heading, winter injury, crude protein content, width of leaf, seed weight, per cent dehulled seed, and pollen grain diameter.

The frequency distribution of the clones for most characters did not fall into a normal curve. When compared with the Ree variety few polycross progeny lines differed significantly from it for agronomic characters while a great many differed significantly from it for a number of morphological characters. Similarly, very few open-pollinated progeny lines were better than Ree or Nebraska-50 in agronomically important characters.

As indicated by correlation coefficients, association between parent clones and progenies was much greater for morphological characters than for yield and vigor.

Useful significant correlations were those between vigor and yield, and plant density and yield. Yield and per cent protein content were significantly

negatively correlated but no morphological character was highly enough associated with protein content to serve as a guide for selecting high protein plants. Such characters as foliage color, leaf pubescence and head pubescence should be useful as markers in any new strains that may be developed.

The study shows that polycross progenies gave a somewhat better indication of general combining ability of parent clones than the open-pollinated progenies.

Microfilm copy of complete manuscript of 86 pages, \$1.08. Enlargements 6" x 8", 10¢ per page.

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

THE FATE OF THE SUGARS IN BREAD DOUGHS AND SYNTHETIC NUTRIENT SOLUTIONS UNDERGOING FERMENTATION WITH BAKERS' YEAST

(Publication No. 3651)

Robert B. Koch, Ph.D.
University of Minnesota, 1952

Analytical methods have been developed for the separation and determination of the various sugars in fermenting doughs. These include an initial extraction of the sugars with hot 70 per cent aqueous ethanol with heating at 80 degrees C. for seven minutes to insure inactivation of enzymes, dialysis of the extract, separation of the sugars in the dialysate by paper partition chromatography, and determination of the individual sugars by a new colorimetric method.

In the synthetic solution experiments, 70 per cent aqueous ethanol and heating at 80 degrees C. were employed to inactivate the enzymes. The sugars present in the solution after enzyme inactivation were determined in the same manner as that used for the determination of the sugars present in the dialysates of the dough extracts. The rates of gas production per 15 minutes were also determined in the synthetic solution experiments.

The methods used for the determination of the sugars in bread doughs were also employed to determine the amounts of the various sugars present in bakers' patent flours. The results showed that the latter contain very small quantities of glucose, fructose, maltose and sucrose. Two unknown fractions were also detected which corresponded in chromatographic behavior to melibiose and raffinose. It is of interest to note that the concentration of sucrose in bread flour was found to be about 0.1 per cent instead of about 1.0 per cent as determined by the less specific methods.

Investigations were carried out on fermenting doughs made from different formulas using different flours and various levels of different sugars, and on fermenting synthetic solutions, which contained additions of different pure sugars. The results of these investigations showed that the hydrolysis of sucrose into its component monosaccharides (glucose and fructose) by bakers' yeast was extremely rapid.

Bakers' yeast preferred glucose as a source of sugar for fermentation but fermented fructose equally well in the absence of glucose. Glucose was fermented at a rapid rate from the start of fermentation and continued to be fermented at a rapid rate throughout the fermentation period or until it was consumed.

In the presence of glucose, fructose was fermented at a slow rate until the glucose content had decreased to a level considerably below that of the fructose; thereafter, the fructose content decreased at a rate similar to that of the glucose. In the presence of sufficient glucose, the rapid fermentation of fructose was prevented in a dough throughout the entire fermentation and baking period, and the bread contained an amount of fructose very similar to that originally present in the dough.

If glucose and/or fructose and maltose were present at the start of fermentation, the concentration of maltose did not decrease at a rapid rate until the glucose and fructose were consumed. However, if bakers' yeast was given sufficient time to adapt itself to maltose fermentation in the absence of both glucose and fructose, the addition of glucose did not prevent a rapid decrease in maltose content during subsequent fermentation. In bread doughs, the maltose content increased very rapidly within the first few minutes after the start of mixing and then continued to increase at a much slower but still fairly rapid rate until the later stages of fermentation as long as there was sufficient glucose and/or fructose to support fermentation. After the glucose and the fructose were used up, the maltose was fermented at a rapid rate. The synthetic solution experiments showed that there was a corresponding temporary decrease in the gas production rate when the maltose fermentation began to assume a principal role.

This research has provided for the first time an exact knowledge of the fate of the individual sugars in bread doughs undergoing fermentation with bakers' yeast.

Microfilm copy of complete manuscript of 139 pages, \$1.74. Enlargements 6" x 8", 10¢ per page.

STUDIES ON THE PHYSICAL AND CHEMICAL PROPERTIES OF STARCH THE RETROGRADATION OF AMYLOSE IN THE PRESENCE AND ABSENCE OF GELATIZING AGENTS AND SIMILAR COMPOUNDS

(Publication No. 3414)

Frank Abel Loewus, Ph.D.
University of Minnesota, 1952

1. By measuring the iodine binding capacity (IBC) of amylose potentiometrically, it has been possible to develop an analytical method for following this property of amylose during retrogradation.

2. The IBC method has been used to determine the effect of concentration of corn and potato amylose (in the region of 0.05 to 0.4% and 0.1 to 1.0% respectively) upon the retrogradation process.

3. Corn amylose has been subfractionated using the Kerr ethylene-diaminediethyl ether fractionation method and the retrogradation of the subfractions has been followed using the IBC method.

4. The effect of neutral salts upon the retrogradation of dilute amylose solutions has been studied. These salts include the alkali halides, CaCl_2 , $\text{Ca}(\text{NO}_3)_2$, MgSO_4 , K_2SO_4 , BaCl_2 , LaCl_3 and ThCl_4 .

5. The effect of pH upon the retrogradation process in 0.1% corn amylose solution between pH 2 and 6 in citrate, glycine and acetate buffers has been determined.

6. The effect of non-ionic compounds, namely, glucose, sucrose and urea upon the retrogradation process in 0.1% corn amylose solution has been followed.

7. The applicability of the Langmuir adsorption isotherm to the iodine titration data obtained during amylose retrogradation is demonstrated. The relationship between the constant, β , and the IBC is shown and the significance of the constant, α , is discussed.

8. Evidence is presented supporting the concept of retrogradation as resulting from hydrogen bond cross linking between amylose molecules. It is further suggested that this cross linking occurs between primary hydroxyl groups attached to carbon 6 on the anhydroglucose unit.

9. Evidence is presented to show that amylose does not absorb upon cellulose but is merely complexed to impurities present on the cellulose. Extraction of the cellulose with 85% methanol is found to remove most of the adsorption properties of cellulose for amylose.

10. The mechanism of retrogradation both in the presence and absence of added chemical agents is discussed.

Microfilm copy of complete manuscript of 188 pages, \$2.35. Enlargements 6" x 8", 10¢ per page.

AGRONOMY

EFFECT OF PRE-EMERGENCE TREATMENT WITH 2,4-D ON WEEDS IN CORN AND ON VARIOUS SOIL PROPERTIES

(Publication No. 3655)

Chandravadan Hiralal Pathak, Ph.D.
University of Minnesota, 1952

The main benefit from the cultivation of corn has generally been reported to be control of weeds. If, therefore, weed control were possible by any other suitable method, cultivation might be reduced or eliminated.

The present study was undertaken to determine whether weeds in corn could be controlled under Minnesota conditions with the pre-emergence application of 2,4-D and if so what effect this treatment

would have on the corn and on various properties of the soil in which the corn was grown.

The following three main treatments were compared as methods of weed control:

1. Cultivation with corn cultivator.
2. Removing the weeds by close cutting instead of cultivation.
3. Pre-emergence application of 2,4-D.

In addition, the study included the effect of nitrogen fertilizer applied with each of these main treatments and the effect of changing the pH of the soil on injury to corn from 2,4-D.

A summary of the results of the experiment follows.

There was no significant difference in yield or date of maturity between the corn on the cultivated plots and on the uncultivated but weed-free plots.

The pre-emergence application of 2,4-D failed to control the grassy weeds and the corn on these plots yielded only 5.9 bushels per acre as compared to 38.3 and 33.8 bushels per acre on the cultivated plots and uncultivated weed-free plots, respectively.

Addition of 20 pounds of nitrogen per acre to the pre-emergence plots at the time of the first cultivation increased the corn yield to 14.6 bushels per acre, but did not increase the weed yield. The application of an additional 20 pounds of nitrogen per acre at the second cultivation resulted in an increase of weed yield only.

Addition of nitrogen hastened the maturity of the 2,4-D treated corn as indicated by water content but had no effect on the cultivated or uncultivated but weed-free corn.

On the uncultivated weed-free plots the pre-emergence application of 2,4-D at 1-1/2 pounds per acre had no injurious effect on corn.

The nitrate content of the soil from the cultivated plots and the uncultivated weed-free plots was significantly higher than from the pre-emergence plots.

The nitrate content of the soil from the uncultivated weed-free plots was higher than from the cultivated plots, although the difference was not statistically significant.

Tissue tests indicated no deficiency of N, P, K in the corn on the cultivated plots and the uncultivated but weed-free plots whereas the corn on the pre-emergence plots was deficient in all three nutrients.

The rate of infiltration of water into the soil was the most rapid in the cultivated plots and the least rapid in the uncultivated weed-free plots, it being intermediate in the pre-emergence plots.

The average moisture of the soil to a depth of 18 inches was greatest for the uncultivated weed-free plots and lowest for the cultivated plots; the pre-emergence plots had an intermediate amount.

It seems that under Minnesota conditions the pre-emergence application of 2,4-D to corn is not a reliable method of weed control.

Microfilm copy of complete manuscript of 37 pages, \$1.00. Enlargements 6" x 8", 10¢ per page.

NECTAR PRODUCTION IN ALFALFA CLONES AS RELATED TO BEE VISITATION AND SEED PRODUCTION INCLUDING A STUDY OF TECHNIQUES FOR MEASURING NECTAR

(Publication No. 3639)

Marion Walter Pedersen, Ph.D.
University of Minnesota, 1952

This thesis is a report of studies conducted at Logan, Utah, from 1946 to 1951 on nectar secretion in alfalfa clones as related to honey bee visitation and seed production. Related literature is reviewed largely from the viewpoint of the plant breeder interested in breeding for increased attractiveness to pollinating insects. This paper is almost entirely restricted to factors concerned with nectar production; however, the author recognizes that other factors are important in attractiveness.

Several methods of nectar extraction were studied. It was concluded that centrifuging in volumetric tubes was satisfactory at low sugar concentrations (below 55 per cent). Determinations made by weight were recommended at higher sugar concentrations. A one-minute period of centrifuging at a speed of 2460 RPM with a swing radius of 2.5 to 3.5 inches was used satisfactorily on alfalfa blossoms. The nectar content of individual flowers was found to be highest in the center of a raceme. Apparently nectar accumulates for several days after opening of the flowers. Before the unpollinated flower drops, however, the nectar has disappeared. Time of day that the sample was collected showed no definite trend in a one-day test. Sugar concentration was different between clones but of a much smaller magnitude than the volume. There was a slight but non-significant tendency for the more abundant nectar to be more dilute. Essentially the same values were obtained in the greenhouse as in the field.

About one-third of the variation in honey bee visitation was found associated with differences in nectar sugar secretion from plant to plant. This was true in both greenhouse and field grown plants.

A high tripping rate per plant was found associated with a lack of bee (nectar collecting honey bees) visitation. As nectar is not secreted after the flower is tripped it was postulated that low bee visitation was a response to low availability of nectar.

Using field grown plants about 77 per cent of the variation in seed production from plant to plant was found associated with variations in numbers of nectar collecting honey bee visitors where a cage was used to restrict the bees. Where a cage was not used, about 39 per cent of the variation was accounted for in the same way.

The average production of nectar sugar per flower was found to be 0.60 mgs. with a concentration of 72 per cent. This is equivalent to 1.2 mgs. of nectar of 50 per cent sugar. On the average the poorest nectar producing plant was found to have 0.34 mgs. of sugar per flower compared to the best producing plant with 1.04 mgs.

Information on the genetics of nectar production were obtained from selfs, crosses and polycross

progenies. That the character is highly heritable was demonstrated with a parent-progeny correlation of +.833**. Normal frequency distributions obtained in selfs and crosses suggested multifactorial inheritance.

Microfilm copy of complete manuscript of 81 pages, \$1.01. Enlargements 6" x 8", 10¢ per page.

ANIMAL HUSBANDRY

THE HERITABILITY OF, AND THE EFFECTS OF SOME ENVIRONMENTAL FACTORS ON, THE BIRTH WEIGHT, THE WEANING WEIGHT, AND THE GREASE FLEECE WEIGHT OF SHEEP

(Publication No. 3434)

Khalid Tahsin Ali, Ph.D.
University of Minnesota, 1952

Phenotypic differences in quantitative characteristics are usually caused by differences in heredity and environment. Hereditary differences may be assigned to differences in dominance, epistatic and additive genetic values.

Information concerning the relative magnitude of each source of variance for each economic characteristic should prove useful in deciding on the most effective methods of selection and systems of mating.

The analysis of weaning weight was made on three inbred lines and one outbred line of Shropshire sheep; that of birth and fleece weight on Shropshire, Columbia, Hampshire and Crossbred sheep. For the analysis of weaning weight, there were available 1227 observations for the study of environmental factors, 890 for the estimation of heritability by parental half-sib correlations and 395 by dam-offspring pairs for heritability based on the intrasire regression of offspring on dam method. Corresponding figures for birth weight are 2943, 1956 and 766; those for fleece weight are 1624, 1624 and 315.

The average weaning weight at an average age of 147.4 days is 69.6 pounds with a standard deviation of 10.3 pounds; that of birth weight is 8.9 pounds with a standard deviation of 1.4 pounds; and that of fleece weight is 9.1 pounds with a standard deviation of 1.3 pounds.

The difference in weaning weight between lambs from mature dams and those from young dams, single and twin born lambs, male and female lambs, are 5.7, 6.5 and 5.7 pounds, respectively. The corresponding differences in birth weight are .67, 1.75 and .048 pounds. The average rate of growth at weaning age is .43 pound per day.

The adjusted estimates of heritability given in the following table were obtained.

The heritability of fleece weight without controlling the variation due to body weight was .52 by the regression method and .32 by the correlation method. This seems to indicate that the rate of improvement

	Paternal half-sib correlation method		Intra-sire regression method	
	H.	S.E.	H.	S.E.
Weaning weight	.14 ⁺	.08	.38 ⁺	.14
Birth weight	.19 ⁺	.05	.54 ⁺	.09
Fleece weight	.27 ⁺	.08	.51 ⁺	.12

of fleece weight through factors other than body weight, such as density and length of staple, should not be much lower than if body weight was left to vary.

Heritability estimates based on the intra-year regression of offspring on dam were obtained for fleece weight. The adjusted estimate is .43 which differed only slightly from the corresponding within sire estimate of .51.

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ANTHROPOLOGY

THE CULTIVATION OF FOOD FISH IN CHINA AND JAPAN: A STUDY DISCLOSING CONTRASTING NATIONAL PATTERNS FOR REARING FISH CONSISTENT WITH THE DIFFERING CULTURAL HISTORIES OF CHINA AND JAPAN

(Publication No. 3582)

Robin Arthur Drews, Ph.D.
University of Michigan, 1952

The purpose of this study is to show that the development of fish-culture in China and in Japan has been consistent with cultural history in each country. To accomplish this purpose it is necessary to describe both the historical development and the modern patterns of Chinese and Japanese pisciculture since these are almost unknown to Western science. The descriptive chapters of the text are supplemented by much additional material in the appendices.

Cultural factors account for man's neglect of many of the water resources he might exploit. Only in Eastern Asia is the commercial cultivation of food fish of primary importance. The Chinese were cultivating common carp in the fifth century before Christ and, when the Christian Era began, pisciculture was already important there. By the seventeenth century Chinese fish-culture had assumed its modern form. Fry of several species of carp were caught in annual fishing operations and were transported throughout the country.

Modern Chinese pisciculturists rear several kinds of large river carps and the striped mullet. South and Central Chinese fry industries supply the needs of the nation. Present-day fish-culture is both an important and highly organized industry but, consistent with the cultural history of China, shows little significant foreign influence.

Japanese fish-culture began with the importation of Chinese carp-culture early in the Christian Era but remained unimportant for many centuries. Only small quantities of two species, common carp and striped mullet, were reared. In the twentieth century, however, Western influence has stimulated the development of conservation programs and the scientific solution of piscicultural problems. Ways of rearing fish in paddies, in small ponds with rapidly moving water, in brackish water and with other species, were perfected. Several species, some of them foreign, were added to those reared but only common carp and eel have been important. During this period the Japanese made significant contributions to fish-culture although foreign influences remained strong.

By contrasting the two patterns it is possible to show clearly that Chinese pisciculture is primarily autochthonous in nature whereas Japanese pisciculture is essentially derivative. In a slow process of development Chinese fish-culture has come to be a vast and relatively efficient native activity adequate to meet the demands placed upon it by the great Chinese population. This slow evolutionary growth and resistance to foreign influence has been true of much of China's cultural history. In Japan the acceptance of Western patterns of fish-culture was as easily accomplished as the earlier acceptance of Chinese fish-culture. The Japanese sought out not only superior foreign ways of rearing fish but foreign fish to supplement their own fauna. This was consistent with a familiar aspect of the cultural history of Japan. The Japanese have shown a willingness not only to accept foreign ways they have learned of but also have searched for patterns from abroad which might be of utility to them.

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BACTERIOLOGY

A STUDY OF BOVINE BRUCELLA AGGLUTININS

(Publication No. 3650)

William Robert Hess, Ph.D.
University of Minnesota, 1952

When the agglutination test is used to detect brucellosis in cattle, it is necessary to select a minimum titer which may be considered indicative of infection. This titer must be low if it is to include all of the reactions due to infection. Unfortunately, serums from non-infected animals are sometimes found to have titers high enough to be confused with specific reactions. Serums of this type have been studied in order to learn how such reactions may be differentiated from those resulting from infection with *Brucella*.

When suspicious-titered serums from animals in herds that are otherwise free of reactors are

subjected to cross absorption studies using a variety of antigens, serums may be found which display a wide range of agglutinating activities and a low degree of specificity. The agglutinating activity of these serums may be destroyed by a heat treatment of 70° C. for 10 minutes. The specific *Brucella* agglutinins must be heated at 90° C. for 10 minutes before a substantial reduction in titer is noted. Differentiation by heating may be obscured by the development of a prozone, but the material responsible for the phenomenon may be removed by centrifugation of the sensitized antigen. When the sedimented antigen is resuspended in saline, agglutination due to specific antibody becomes apparent.

Non-specific *Brucella*-agglutinating substances may be detected by means of a filter paper chromatogram of the ascending type using a phthalate buffer (0.05 M, pH 6.2) as a developer and a hematoxylin-stained *Br. abortus* antigen to locate the agglutinins on the paper. The non-specific substances remain adsorbed at the spot where the serum is placed, while the specific agglutinins migrate with the developer. These substances appear to account for 60 per cent of the suspicious-titered reactions in 290 serums from animals in suspect herds, while they account for less than 5 per cent of the titers in 198 suspects from herds also containing reactors. Similar substances are found in serums from humans, swine, and horses. Substances of this type may be removed and concentrated from bovine serums by adsorption on cellulose. Distilled water serves as an eluting agent. By this method it is possible to recover about 35 per cent of the material at a concentration eight or nine times as great as in the original serums. *Brucella* organisms may also be used as an adsorbent. Here again distilled water serves as an eluting agent. Yields of close to 40 per cent are obtainable by this procedure. Less than 2 per cent of the specific agglutinins adsorbed on *Brucella* organisms can be recovered by elution with distilled water.

Complete precipitation of the non-specific substance can be achieved by 30 per cent saturation with ammonium sulfate, while 50 per cent saturation is required for the precipitation of the specific *Brucella* agglutinins.

Serum fractionation studies show the specific *Brucella* agglutinins are associated with the gamma globulins. The non-specific substance is found in a fraction containing isoagglutinins, cold insoluble globulins, and a number of constituents concerned with the clotting of blood.

Immunological studies indicate that the non-specific agglutinating substances characterized by adsorption on cellulose are not identical in all cases.

Microfilm copy of complete manuscript of 84 pages, \$1.05. Enlargements 6" x 8", 10¢ per page.

**GROWTH CURVES OF SALMONELLA PULLORUM
IN DIFFERENT MEDIA AND SOME
OBSERVATIONS ON THE IN VITRO ACTION
OF NEOMYCIN**

(Publication No. 3571)

Delbert Eugene Schoenhard, Ph.D.
Michigan State College, 1951

The purpose was to determine the bacterial culture cycle through part of the stationary phase of five strains of *Salmonella pullorum* when grown in three different media and to investigate the effect of certain factors on the action of neomycin.

Growth determinations were made by taking samples from either the same culture or from a different culture at regular intervals and determining the number of organisms per ml. by plate counts.

Sensitivity to neomycin and effect of pH, sodium chloride, and some of the constituents of the synthetic medium and nutrient broth on action of neomycin were ascertained by tube-dilution method.

The effect of temperature on the action of neomycin was determined by incubating cultures that were in the logarithmic phase at 4° C., 20° C., and 37° C. with neomycin for 18 hours and determining the number of organisms per ml. by plate counts.

The effect of size of inoculum on the action of neomycin, using three different concentrations of it, was determined with 6 different sized inocula. Number of organisms per ml. at 0, 30, 60, 120, and 240 minutes was ascertained by plate counts.

The effect of the growth phase on the action of neomycin, using two different concentrations of it, was determined with organisms in the logarithmic and stationary phase. Incubation was carried out at 37° C., and the number of organisms per ml. determined by plate counts.

All strains grew most rapidly in nutrient broth; they grew more rapidly in 1 per cent tryptose-water than in the synthetic medium.

The maximum number of viable organisms in the stationary phase was higher in the synthetic medium than either of the other media which had about the same number.

Comparable growth curves for organisms grown in the same medium, either 1 per cent tryptose-water or nutrient broth, were established by both procedures.

The synthetic medium developed was composed of arginine, cystine, histidine, leucine, valine, thiamine hydrochloride, calcium pantothenate, glucose, salts, asparagine, and trace elements.

Leucine was essential for all strains.

Largest bactericidal concentration of neomycin was needed in sensitivity tests with synthetic medium; about the same bactericidal concentration of neomycin was needed in sensitivity tests with either 1 per cent tryptose-water or nutrient broth.

Neomycin was bactericidal in concentrations only slightly higher than that in which it was bacteriostatic.

The sensitivity of an organism to neomycin was governed by the medium in which it was tested rather than by that in which it was grown.

An alkaline medium favored the action of neomycin.

The action of neomycin was not affected significantly by lowering the temperature from 37° C. to 4° C.

Neomycin was equally lethal to organisms in the stationary phase or the logarithmic phase.

The size of inoculum was changed one hundred thousand-fold with 3 different concentrations of neomycin without influencing significantly its action.

The rate of action of neomycin was most rapid in the highest concentration used; it decreased noticeably with each 10-fold decrease in concentration.

Only glucose, peptone, beef extract, and sodium chloride seemed to interfere with the action of neomycin. Sodium chloride interfered most.

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BIOGRAPHY

FROM BENJAMIN FRANKLIN TO HENRY ADAMS: A STUDY OF AMERICAN AUTOBIOGRAPHY

(Publication No. 3594)

Robert Lawrence Coard, Ph.D.
University of Illinois, 1952

The purpose of this study has been to explore the field of American autobiography from Benjamin Franklin to Henry Adams. The self-written lives of Americans published between 1791 and 1918 have been largely forgotten by the general public. Since the amount of material available is so vast, it has been possible to examine only the more representative works. A classification according to the occupation of the autobiographer as emphasized in his book has been used in place of a chronological thread, which seemed too weak a tie to bind together gamblers and bishops, Indian fighters and temperance advocates.

During the first decades of the nineteenth century autobiographies were few, but by its midpoint they were common enough. After the Civil War, and partly because of it, but chiefly owing to the growth of the magazine, their number waxed even greater. By the opening of the twentieth century they were offering an embarrassment of riches.

Of all groups clergymen produced the most autobiographies, with Methodist and Congregationalist-Presbyterian ministers being the most prolific. Preachers like Peter Cartwright, James Finley, and Samuel Pickard penned unforgettable scenes of religious pioneering in the West. Generals, following the examples of Scott, Sherman, Grant, and Sheridan, wrote a goodly number of autobiographies, whose intrinsic interest often compensates for undue length and fatiguing controversy. The naval autobiographers are rich in action and humor and sometimes in poetic coloring.

Politicians and public figures often become entangled in controversy and prolixity. Still Carl Schurz and Cassius Clay are among the better American autobiographers. In telling the story of their strenuous lives, social critics and reformers have supplied a wealth of information in surprisingly well chosen words about the anti-slavery crusade and the agitation for negro rights, women's rights, slum clearance, prison reform, temperance and prohibition. Nineteenth century men of letters like John Neal and Samuel Goodrich serve to remind the student that the personal narratives of the twentieth century authors and newspapermen have a long literary ancestry behind them. Similarly the reminiscing medical man of today was preceded by such doctor-autobiographers as Wyeth, Sims, Gross, and Benjamin Rush himself. Some of the older scientists too, especially the geologists, set down the story of their careers.

The autobiography of childhood and youth was firmly established in American literature by such able writers as Aldrich, Howells, Warner, Lucy Larcom, Muir, James, and Garland. How well the variety and complexity of life are reflected in autobiography is made clear when one reads the narratives of Indians and businessmen, pioneers and actors, fast-talking promoters and artists, college presidents, counterfeiters, and horse thieves.

A large number of these autobiographies were drastically edited. Many like Franklin's are fragmentary, and most of the remainder suffer from faulty construction. Garrulity, reticence, excessive apologetics, overweening pride, and textual barriers in the form of long quotations from letters, speeches, and diaries are among the sins of the authors. On the other hand, one is able to become directly acquainted with some remarkable personalities like Phineas T. Barnum and Benjamin F. Butler. Autobiographers also describe many other interesting people. The time spirit of former generations, belief in the self-made man and faith in unlimited progress, is admirably illustrated in these accounts. If the older autobiographer was too reserved in telling his story, he nevertheless presented many colorful segments of life that were overlooked by the novelists, poets, and dramatists of his age.

Microfilm copy of complete manuscript of 433 pages, \$5.41. Enlargements 6" x 8", 10¢ per page.

BIOLOGICAL CHEMISTRY

STUDIES ON THE DISTRIBUTION AND PROPERTIES OF A CYTOCHROME OXIDASE IN THE TISSUES OF HIGHER PLANTS

(Publication No. 3660)

George Calvin Webster, Ph.D.
University of Minnesota, 1952

An enzyme which could oxidize cytochrome c was extracted from the roots, leaves, or fruits of 54 different species representing 23 families of dicotyle-

donous plants. This cytochrome oxidase could be separated from the tyrosinase which occurred in many of these plants. The cytochrome oxidase activity was inhibited by carbon monoxide and the inhibition could be reversed by exposing the system to light, while the carbon monoxide inhibition of tyrosinase activity was definitely not affected by light. The cytochrome oxidase was found in every case to be bound to small particles in the cell.

Some of the properties of the cytochrome oxidase from the potato tuber were studied. Optimal conditions for assay of the cytochrome oxidase were established. The effect of oxygen concentration on oxidase activity was determined and the Michaelis constant of the oxidase-oxygen complex was found to be 6.5×10^{-6} M at 25° C. The oxidase was strongly inhibited by cyanide, azide, hydroxylamine, and carbon monoxide.

It was not inhibited by the iron chelating agents, o-phenanthroline and 2, 2'-dipyridyl, or the copper chelating agents, a-benzoin oxime and salicylal-doxime. The inhibitory effect of carbon monoxide on potato cytochrome oxidase was compared with the effect of carbon monoxide on beef heart cytochrome oxidase and on potato tyrosinase. The distribution constants (K_{CO}/K_{O_2}) for these enzymes were: 2.85 for potato cytochrome oxidase, 3.68 for beef heart cytochrome oxidase, and 1.42 for potato tyrosinase. The dissociation constant of the potato cytochrome oxidase-carbon monoxide complex was 1.85×10^{-5} M at 25° C.

An absorption spectrum similar to that of a typical cytochrome system was found if the potato cytochrome oxidase was examined at -195° C.

Respiration in the non-photosynthetic tissues of twelve different dicotyledonous plants was studied and in all cases was strongly inhibited by carbon monoxide. The inhibitions were completely or almost completely reversed by light in every case but in slices of apple fruits, thus pointing to the importance of cytochrome oxidase in the respiration of the majority of plants examined.

Microfilm copy of complete manuscript of 73 pages, \$1.00. Enlargements 6" x 8", 10¢ per page.

A STUDY OF THE METABOLISM OF CAFFEINE AND THEOPHYLLINE

(Publication No. 3561)

Herbert Weinfeld, Ph.D.
University of Michigan, 1952

It is known that in man, the rat, and the dog, caffeine (1,3,7-trimethylxanthine) and theophylline (1,3-dimethylxanthine) are converted to substances which yield color with those reagents used for the colorimetric determination of uric acid. In the case of man and the rat the chromogenic material is not uric acid. Strong indirect evidence was obtained by previous workers for the identity of these chromogens with methyluric acids. However, conclusive proof of the formation of methyluric acids from methylxanthines is lacking.

The rabbit, like the dog and man, can partially demethylate caffeine to other "less methylated" methylxanthines. It has not been determined whether the rabbit also converts caffeine to substances which yield color with the uric acid reagents and which possess the properties of methyluric acids.

Two types of experiments were performed:

1. The metabolism of caffeine in the albino rabbit was studied with specific reference to possible conversion to methyluric acids. It was necessary to fractionate the urinary chromogens into true uric acid and non-uric acid substances. An increased excretion of non-uric acid chromogens would indicate, most probably, the conversion of caffeine to methyluric acids. If complete demethylation and oxidation of caffeine to uric acid occurred this would be reflected in a rise in urinary uric acid and a larger rise in urinary allantoin, since the end-product of the metabolism of xanthine in this animal is allantoin. For this reason allantoin was also determined. In order to show that any elevation in the excretory products was due to alteration of caffeine, the amount of the intravenously injected compound excreted in the urine unchanged was determined and compared to the amount administered.

2. Methylxanthines were administered orally to experimental animals. By chromatographic analysis, attempts were made to identify chromogenic methyluric acids excreted in the urine.

In the first series of experiments with rabbits, the injection of caffeine was followed by an increased excretion of substances which yielded color with uric acid reagents. The largest portion of this chromogenic material (71-94 per cent) was non-uric acid in character. Allantoin excretion was elevated but the increase was not proportional to the amount of caffeine administered. The maximum quantity of caffeine excreted in the urine unchanged was 13.3 per cent of the amount injected.

The application of paper chromatography to the urines of experimental animals revealed that theophylline was converted to 1,3-dimethyluric acid and 1-methyluric acid in a rabbit, a human subject, and a group of rats. In the same human subject, caffeine was transformed to 1-methyluric acid and possibly 1,3-dimethyluric acid. In the rabbit which had received theophylline, caffeine was converted to 1,3-dimethyluric acid and probably 1-methyluric acid.

It may be concluded that the non-uric acid chromogens excreted by the rabbits which received caffeine intravenously were composed of methyluric acids. The extent of conversion of caffeine to chromogenic methyluric acids in these animals was estimated to be approximately 25 per cent. The increase in urinary allantoin was probably not the result of the conversion of caffeine to this compound because of the pattern of the allantoin excretion. The chromatographic results fully support the idea previously expressed by other workers that methylxanthines are converted to methyluric acids in the animal organism.

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BIOLOGY

SPONTANEOUS ABERRATIONS IN CHROMOSOME NUMBER (TRIPLOIDY AND HAPLOIDY) AMONG LARVAE OF THE TWO-LINED SALAMANDER, EURYCEA BISLINEATA

(Publication No. 3011)

Joseph Vitold Michalski, Ph.D.
Princeton University, 1942

Cytological investigations of preserved amphibian embryos, also of one adult, have demonstrated the occasional occurrence of triploidy. By use of the tail tip technique, the studies of frequency and range of polyploidy have been applied to larvae of various urodele species. A frequency of approximately 1% has been found in *Triturus viridescens* and *T. pyrrhogaster*, using this method. Other deviations from the normal chromosome number, ranging from haploidy to pentaploidy, have been reported in *Triturus viridescens*.

In *Eurycea bislineata*, the two lined salamander, previous investigations gave a figure of approximately 10% triploidy. This frequency has been re-investigated here, also a search made for other types of chromosomal aberrations.

Triploids have been identified directly by chromosomal counts made on metaphase plates in the epidermis of the tail fin, and indirectly by comparison of the size of resting nuclei with those of controls. Pigment pattern changes related to increased chromosome numbers also serve to distinguish aberrant individuals.

On the basis of 412 larvae studied the frequency of triploidy in *Eurycea* has been found to be approximately half that previously reported, or about 5.3%. In their later development the triploid larvae manifest various abnormalities of structure and function which may be indirectly related to increased chromosome number.

Microfilm copy of complete manuscript of 93 pages, \$1.16. Enlargements 6" x 8", 10¢ per page.

THE DEVELOPMENT OF THE GONADS IN TRIPLOID LARVAE OF TRITURUS VIRIDESCENS OBTAINED FROM REFRIGERATED EGGS, WITH PARTICULAR REFERENCE TO GERM CELL NUMBER

(Publication No. 3022)

Rev. William Thomas Powers, Ph.D.
Princeton University, 1947

The purpose of this investigation was to determine the effect of triploidy on sex differentiation and germ cell number in *Triturus viridescens*. Triploidy was induced by subjecting the eggs to a cold treatment of +2.0° C immediately after laying. This treatment interrupts the completion of the

the second maturation division resulting in eggs with a diploid chromosome count; this combined with the haploid number of chromosomes supplied by the sperm produces a triploid larva. Treatments of thirty minutes were effective in producing triploidy. Spontaneous triploids occurred relatively frequently. In a total of 119 control larvae 10 were spontaneous triploids. One female produced seven triploids out of a total of 29 larvae.

Chromosome counts were made from mitotic figures in amputated tailtips of young larvae. When the larvae reached developmental stage F11 about one-third of the tail fin was amputated and fixed in Bouin's solution. It was then stained with Harris haemalum. The whole mount is sufficiently thin so that the oil immersion lens may be used on all portions of the fin, which consists of two layers of epidermis and a thin layer of connective tissue in between. Mitotic figures are usually present in the epidermal cells, and the chromosomes may be counted in metaphase figures.

The larvae were raised beyond metamorphosis in a combined terrarium and aquarium which permitted them to leave the water on the completion of metamorphosis.

Developmental stages F11, F15, H0, H5, H10 and H13 (characterized externally by changes in the developing forelimb in the F stages, and in the hindlimb in the H stages) were studied in both diploid and triploid larvae. The larvae were fixed in Michaelis' solution at these stages, imbedded in "Tissue-mat," sectioned at 15 micra, and stained with Harris' Haemalum and Orange-G. This made possible a careful comparison of gonadal development in diploid and triploid larvae. In general, triploid gonads are smaller in cross-section than the diploids. The length of the gonads in triploids at first is much reduced; however, it gradually approaches the diploid size in later development. The first indication of ovarian differentiation was observed in stage H10. This was marked by the presence of oogonia and the ovarian cavity. In the oldest stage studied differentiation had progressed further in diploid ovaries with the presence of very young and young oocytes. In the presumed testis at this stage the gonad is a solid structure with still undifferentiated germ cells. Differentiation is delayed in triploid larvae. In the oldest triploid ovaries examined only oogonia were present. The gonads of all six triploids with clear-cut differentiation were ovaries. The gonads of a seventh triploid with still undifferentiated germ cells presumably were very young testes.

The average total number of germ cells in the two youngest stages examined showed a 2N/3N ratio of 27:6 and 42:17. The average number of germ cells in the left gonad of later larval stages showed a 2N/3N ratio of 37:21, 103:50, 226:163 and 453:236. The triploid germ cells were noticeably larger than the diploid.

Further experiments showed that inanition delays differentiation in both diploid and triploid larvae. Starvation also affects the germ cell number. In diploid and triploid larvae which were starved from stage H5 on there was a definite regression in the condition of the gonads.

The results of these experiments are compared with those obtained by Kawamura who worked with parthenogenetic triploid *Rana nigromaculata* and *Rana japonica*.

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BOTANY

A STUDY OF PHYTOTOXIC ACTION OF 2,4-DICHLOROPHENOXYACETIC ACID ON CERTAIN AQUATIC PLANTS

(Publication No. 3644)

Tung-Fang Chao, Ph. D.
University of Minnesota, 1952

A study of phytotoxicity of 2,4-D, a common herbicide, was made on two kinds of small aquatic plants: duck weed (*Lemna minor*) and water fern (*Salvinia rotundifolia*).

The plants were cultured in nutrient solution and grown under continuous light at room temperature. Hoagland's, Trelease's solution and modified nutrient solutions were employed in this investigation.

It was found that the Trelease's solution was the one suitable for *Salvinia* growth. With properly adjusted initial pH values, both Hoagland's and Trelease's solution were satisfactory for culture of *Lemna* plants. A constant pH was not obtained in modified solutions with various ratios of NO_3 and NH_4 .

The results indicate that both ester and ammonium salt formulations were not suitable for either qualitative or quantitative study of 2,4-D in nutrient solution. However, amine salts and carbowax mixture of 2,4-D were satisfactory for those studies.

Lemna plants were unable to survive in nutrient solutions containing such 2,4-D solvents or carriers as kerosene and tributyl phosphate in a concentration as low as 0.3%. Diethanolamine, triethanolamine and carbowax 1500 were not injurious to *Lemna* plants in the concentration used in

A carbowax 2,4-D mixture was found to be more effective in inhibiting the growth of *Lemna* plants than equivalent weight of amine salts of 2,4-D. Addition of a wetting agent increased the toxicity of 2,4-D.

The toxicity of 2,4-D varied with the composition of the nutrient solution. Increase in concentration of 2,4-D increased toxicity in Trelease's solution but not in Hoagland's solution.

In nutrient solution of low pH, the diethanolamine salt of 2,4-D, in the concentration used, was many times more toxic to *Salvinia* plants than at the high ones.

Addition of indoleacetic acid to nutrient solutions containing 2,4-D decreased the toxicity of 2,4-D in Trelease's solution and increased it in Hoagland's solution.

When treated plants were transferred to nutrient solutions free from growth-regulating substances, the plants treated with 2,4-D plus indoleacetic acid showed greater increases in dry weight than those treated with 2,4-D alone.

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STUDIES ON THE PHYSIOLOGY OF THE RUST FUNGI

(Publication No. 3410)

Hugh Howison Hotson, Ph. D.
University of Minnesota, 1952

The object was to grow the rust fungi, now known as obligate parasites, in pure culture. Three basic approaches were made: (1) suppression of rust development with a specific chemical and correlation of the mode of action with that known for other organisms, (2) study of the reaction of rust germ tubes to chemical stimuli, and (3) attempts to grow rusts in tissue culture and to recover saprophytic forms.

The application of chemicals to the soil to inhibit rust development required high rates and was expensive. The margin between plant toxicity and rust suppressing effect of the chemicals was too narrow to be practical. Chemicals were more effective when applied as a foliage spray. Among 57 detergents tested, Tween-20 (polyoxyethylene sorbitan monolaurate), was neither phytotoxic nor fungitoxic at 3% by volume. At 1% it penetrated leaves well and was therefore adopted as a standard spray ingredient.

Seven-day-old wheat seedlings (vars. Little Club, Spelmar, and Khapli) were inoculated with race 56 of *Puccinia graminis tritici*, then sprayed three days later with the test chemical in 1% Tween-20. Rust infection types were determined fourteen days after inoculation. Sulfadiazine at 300 ppm in 1% Tween-20 (ca. 14 lbs/acre) was most effective, but sulfapyridine, sulfapyridine, sulfamerazine, and gantrisin (3,4 dimethyl-5-sulfanilamide-isoazole), at the same concentration, also suppressed rust development. Picric acid, 2,5 dinitro benzoic acid, 2,4,6 trinitro benzoic acid, and saccharine also were inhibitory, but the margin between phytotoxicity and rust inhibition was so narrow (200 to 300 ppm) as to make them unsuitable as therapeutants.

If the mode of action of the sulfa drugs followed the Wood-Fildes theory of para-amino benzoic acid competition, then the addition of para-amino benzoic acid should enable the rust to recover. Nearly complete recovery resulted when para-amino benzoic acid and when folic acid were added. Methionine and glutathione did not enable the rust to recover. One may conclude that para-amino benzoic acid and folic acid are vitamins in the metabolism of wheat stem rust. This evidence also lends support to the hypothesis that para-amino benzoic acid is a constituent in the biological synthesis of folic acid.

Approximately 100 chemicals were tested for

their effect on growth of rust germ tubes but none were consistently stimulatory.

The tissue culture technique of Gautheret was used in trying to produce a balanced system between certain rusts and hosts: (a) the galls of *Gymnosporangium juniperi-virginianae* on Juniper; (b) canes of *Rubus* systemically infected with *Gymnoconia peckiana*; (c) the witches' broom of *Vaccinium* sp. caused by *Calaptospora columnaris*; (d) flax rust (*Melampsora lini*, race 240) on Bison flax; and (e) white pine blister rust (*Cronartium ribicola*) on *Pinus strobus*. It was possible to obtain both infected and uninfected callus tissue only with (a).

The first attempts with the *Gymnosporangium* galls were unsuccessful because of a very strong oxidase system which produced dark melanin-like compounds when the cut surface was exposed to air. When ascorbic acid (150 mg/l) was added to the medium (Gautheret's IV) the galls grew very slowly both in infected and uninfected tissue. Yeast extract increased the growth rate slightly. After about four months typical telial horns were produced in twenty-two of the calluses. During the next few weeks a white mycelial collar grew out at the base of the horn. When stained by the Giemsa technique, the hyphae were binucleate, dicotomously branched, and without clamp connections. The hyphae adjacent to the telial horns produced teliospores terminally on lateral branches, but those approximately one mm. away from the horn produced none. When the telial horn was aseptically cut off at the surface of the gall, new mycelium grew from the galls and produced teliospores on lateral branches but no horns were formed. Thus the generic character of *Gymnosporangium* was replaced by that of *Puccinia*.

Although callus material was subcultured, no evidence of rust could be found in it. Thus the main object, a balanced subculturable system of rust and host, was not achieved.

From one 4-month-old callus a slow-growing fungus grew out on to the medium and after one month had killed the whole callus. The fungus, when isolated, grew very slowly on sucrose minimal medium and yeast-beef agar. On potato-dextrose agar and malt agar, it attained a diameter of only 3.5 cm. in 5 months. Growth was greatly inhibited on corn meal agar (1 cm. in diameter in 6 months).

When callus tissue of *Crataegus americana* was inoculated with this fungus, short aecial-like structures were produced. On potato-dextrose agar at temperatures below 18° C small, black cuplike structures appeared. When plants of *Juniperus virginiana* in the field were inoculated with the fungus, small galls appeared in four months and are still under observation. Although this may be a saprophytic mutant of *Gymnosporangium juniperi-virginianae*, it may be a fungus hitherto overlooked because of its extremely slow growth. Studies are being continued.

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RELATIONSHIP OF IRON AND COPPER
TO ASCORBIC ACID IN PLANTS

(Publication No. 3568)

Robert Leon LeBrec, Ph. D.
Michigan State College, 1951

Reviewing the literature, it was shown that the oxidation of ascorbic acid *in vitro* may be catalysed by copper and iron ions. *In vivo* experiments, the effect of these elements on the status of ascorbic acid in plants is still very obscure. It was suggested that the concentration of this vitamin in plants is related to the synthetic power of the plant tissues to form this compound and to the stability of ascorbic acid in the plant cell. The object of the present study was to investigate the effect of different concentrations of copper and iron in the nutrient media on the concentration of ascorbic acid in the plants at time of harvest and on its stability during the drying of the plant tissues.

Wheat, tomato and tobacco plants were grown on nutrient solutions supplied with various concentrations of copper and iron.

In most cases, a greater stability of ascorbic acid in the drying plant tissues was associated with a greater concentration of copper and iron in the nutrient solution. However, no general correlation between the concentration of ascorbic acid in the fresh material and the concentrations of copper and iron in the nutrient solution was apparent from the data obtained.

The possibility of an interaction between copper and iron was suggested because a positive relationship between the amount of iron in the plant and the stability of ascorbic acid was more apparent in plants supplied with various amounts of iron than with various amounts of copper in the nutrient solution.

The divergence in the effects of copper and iron on the stability of ascorbic acid *in vitro* and *in vivo* may be explained by the formation of organic complex. This hypothesis was discussed.

A greater concentration of ascorbic acid was found in the young active tissues than in the old mature tissues. The larger concentration of ascorbic acid was not related to the stability of this vitamin during the drying of the plant tissues. It could be concluded, therefore, that the power of synthesis of the tissues to form ascorbic acid is the most important factor governing its concentration in the living plant tissues.

The presence of copper in the nutrient solution was found to exert a depressing effect on the accumulation of iron in tomato and tobacco plants. It was also found that to a high concentration of iron in the solution corresponded a low accumulation of manganese in the plants. However neither of these conditions could be related to the concentration of ascorbic acid in the fresh tissues or to its stability during drying.

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CHEMISTRY

THE CONSTRUCTION AND CALIBRATION OF A
LIGHT SCATTERING PHOTOMETER

(Publication No. 3405)

William E. Bleidner, Ph. D.
University of Minnesota, 1952

A light scattering photometer is described. This instrument is not an absolute photometer in that it yields no turbidity value directly but requires a comparison of the light scattered by an unknown with that scattered from a material of known turbidity.

The instrument possesses certain elements of originality which are felt to be of sufficient interest to warrant a detailed description of its construction and performance. One of the unique features is an optical arrangement of the primary light beam and of the measuring photomultiplier which permits the use of simple test tubes in the capacity of light scattering cells. An intense primary beam is focused to a sharp narrow dimension at a point within the cell corresponding to the region of observation of the photomultiplier. A number of diaphragms have been strategically located so as to prevent stray reflectances from entering the photomultiplier tube. The photomultiplier observation assembly consists of a turntable so arranged as to permit its rotation about the cell as a center. Readings are possible in the direction of the primary beam and at all angles between 45° and 135° to this direction. This permits turbidity readings to be made at 90° and dissymmetry corrections to be established on the basis of angular pattern.

Depolarization measurements can be accomplished through the insertion of polaroid plates in the scattered beam and/or primary beams. The source of monochromatic primary radiation is an AH-4 mercury arc plus appropriate filters.

The instrument has been calibrated in terms of a series of pure liquids used as standards and in terms of a series of polystyrenes used as standards. Its performance is judged satisfactory in terms of:

1. The general reproducibility of readings.
2. The general agreement between measured ratios of turbidity for standard materials with ratios from literature values on these materials.
3. The general agreement of molecular weight values on a given sample when measurements are made at different wave lengths and in different solvents.

Microfilm copy of complete manuscript of 149 pages, \$1.86. Enlargements 6" x 8", 10¢ per page.

STUDIES IN FLOW SYSTEM KINETICS CONTINUOUS CATALYTIC CONVERSION OF ETHYLENE TO ETHANE

(Publication No. 2929)

Donald Walter Collier, Ph. D.
Princeton University, 1944

This abstract covers the unrestricted part of the research work carried on by the author in partial fulfillment of the requirements for the degree of Doctor of Philosophy. The restricted part which cannot be here presented, was done in connection with the Rubber Reserve Company project PR-3-ED-154 at Princeton University 1943-1944.

The literature in the general field of contact catalytic gas reactions in flow systems and in the particular field of the catalytic hydrogenation of ethylene to ethane is reviewed. The influence of such factors as time of contact and chemical kinetics, flow conditions within the bed, diffusion to the external surface of and within the catalyst particles, and heat transfer upon the problem of predicting the operation of large scale reactors from data obtained in laboratory models, is discussed and experimental methods of determining the relative importance of these factors are suggested.

In connection with the influence of flow conditions on the time of contact, an investigation of the time taken for a "tracer" gas in a carrier stream of air to pass through a packed bed of uniform "celite" pellets at varying flow rates was undertaken. The "apparent free volume" in the bed, the product of this time and the total volume rate of flow of the gas, was found to increase with the flow rate, and this phenomenon was shown to be mainly due to preferential adsorption of the tracer gas upon the surface of the pellets. The possibility of the flowing gas "short circuiting" through the pockets in the bed at low flow rates is discussed.

The results of nearly isothermal experiments involving low conversions of ethylene to ethane are presented to show that the reaction approached bimolecularity at 90° C. over the Cu-MgO catalyst used. This is discussed in the light of previous investigations of the reaction. Two rate laws, equivalent to each other, fitted the data equally well over the concentration range investigated.

They were:

$$\frac{d[C_2H_6]}{dt} = K_L P_{H_2} \frac{b P_{C_2H_4}}{1 + b P_{C_2H_4}} \quad (1)$$

$$\frac{d[C_2H_6]}{dt} = K_F P_{H_2} P_{C_2H_4}^y \quad (2)$$

The constants in these equations were determined at 83.3° C. and at 96.6° C. and from the temperature variation of K_F the apparent activation energy of the reaction was determined to be 11 K. Cal.

The effect of mass transfer to the catalyst surface was investigated, but the data were inconclusive.

The implications of the assumption of isothermality in a continuous reaction involving a large heat release are discussed in the light of experimental results with the present reaction, and a method by

which the exothermicity of a reaction may be used to measure its kinetics is suggested.

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REACTION OF ETHYLENE OXIDE WITH SOME ALKYL MAGNESIUM IODIDES

(Publication No. 3565)

Harold Melvin D'Arcy, Ph. D.
Michigan State College,

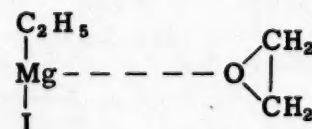
When two moles of ethylene oxide was reacted with one mole of ethylmagnesium iodide a precipitate was obtained which gave the correct analysis for $C_6H_{13}O_2MgI$. Hydrolysis gave excellent yields of both n-butanol and iodohydrin indicating that the Grignard reagent had been attacked at both the ethylmagnesium and magnesium-iodine bonds to give $C_2H_5CH_2CH_2OMgOCH_2CH_2I$.

When the solution which resulted from addition of one mole of ethylene oxide to one mole of ethylmagnesium iodide was hydrolyzed both n-butanol and iodohydrin were formed. Thus, indicating that both the ethylmagnesium and magnesium iodide bonds had been attacked. The most probable intermediates would be $C_2H_5CH_2CH_2OMgI$ and $C_2H_5MgOCH_2CH_2I$.

If one-half mole of ethylene oxide was added to one mole of ethylmagnesium, a precipitate was formed and showed the following analysis:

Condensation No.	% Iodine	% Magnesium
1	53.8	10.0
2	55.1	9.8
Calculated for C_4H_9OMgI	56.7	10.7

This empirical formula would be correct for either $C_2H_5CH_2CH_2OMgI$ or $C_2H_5MgOCH_2CH_2I$ or a complex corresponding to the one suggested by Meisenheimer and his co-workers.¹



Hydrolysis of the precipitate gave neither the n-butanol nor iodohydrin. However, if the complex was gently heated ethylene oxide was given off. By careful cooling and redistillation the amount of ethylene oxide recovered was approximately ninety-three per cent of the theoretical required by the above simple addition complex, in which the alkyl magnesium nor the magnesium iodide bonds have been attacked.

Reactions were carried out between the following alkyl magnesium iodides and ethylene oxide.

Percentage Yields of Alcohols and Ethylene Iodohydrin Based Upon the Titrated Grignard Reagents

	RMgI + (CH ₂) ₂ O No Heat	RMgI + 2(CH ₂) ₂ O No Heat	RMgI + (CH ₂) ₂ O Heat
Methylmagnesium Iodide			
1-Propanol	54%	64%	Exploded
Iodohydrin	36%	29%	
Ethylmagnesium Iodide			
1-Butanol	53.7%	72%	40%
Iodohydrin	20%	40%	13.5%
n-Propylmagnesium Iodide			
1-Pentanol	36.3%	61.5%	35%
Iodohydrin	30%	53%	15%
i-Propylmagnesium Iodide			
3-Methyl-1-butanol	32.6%	49.3%	30%
Iodohydrin	21.5%	51%	18.4%
n-Butylmagnesium Iodide			
1-Hexanol	35.2%	64.3%	36.9%
Iodohydrin	24.3%	58.1%	22.2%
s-Butylmagnesium Iodide			
3-Methyl-1-pentanol	18%	35%	
Iodohydrin	26.2%	43%	
i-Butylmagnesium Iodide			
4-Methyl-1-pentanol	18.5%	26.3%	
Iodohydrin	30.1%	54.3%	

All condensations yielded small amounts of acetaldehyde as by-products.

1. Meisenheimer, J., and Casper, J., Ber. 54B, 1655-1665 (1921).

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THE THERMAL DECOMPOSITION OF N-BUTANE

(Publication No. 2941)

Leonard Sidney Echols, Jr., Ph. D.
Princeton University, 1938

Abstract not available.

Microfilm copy of complete manuscript of 105 pages, \$1.31. Enlargements 6" x 8", 10¢ per page.

THE CARBON TETRACHLORIDE EXTRACTION OF COPPER (II) DITHIZONATE

(Publication No. 3407)

Robert Warren Geiger, Ph. D.
University of Minnesota, 1952

The necessity for the purification of carbon tetrachloride to be used in the dithizone extraction of cupric copper from acid aqueous solutions was experimentally proven and a satisfactory method of purification is presented.

The equilibrium constant for the carbon tetrachloride extraction of primary cupric dithizonate was

determined by two methods. The first of these involved the determination of several equilibrium constants for the reactions involved in the extraction. The second method consisted of directly measuring the equilibrium concentrations of the reactants and products in the two phases. Reasonable agreement was obtained.

The solubilities of dithizone and of primary and secondary cupric dithizonate in carbon tetrachloride and water were determined. The preparation of the dithizonates is described.

The constant for the equilibrium between primary and secondary copper dithizonate was determined.

The results of a brief study of the kinetics involved in the carbon tetrachloride extraction of primary copper dithizonate from acid solutions are presented. It is concluded that this reaction is of the third order, the rate depending on the square of the dithizone concentration in the carbon tetrachloride solvent phase. The rate is substantially independent of the acidity in the pH range 0-2.

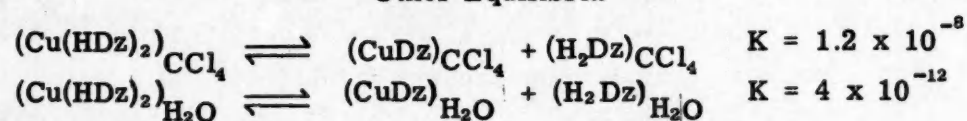
The conditions for a successful separation and determination of trace quantities of copper are presented.

The important physical and chemical constants for the Cu⁺⁺-dithizone-carbon tetrachloride system are summarized in the following table, given on page 250.

Physical and Chemical Constants for the System Cu^{++} -Dithizone-Carbon Tetrachloride

Substance	$P_{\text{CCl}_4/\text{H}_2\text{O}}$	Soly. H_2O	Soly. CCl_4	$K_{\text{ioniz.}}$	K_{sp}	$K_{\text{eq}} (\text{H}_2\text{O}-\text{CCl}_4)$
		<u>M</u>	<u>M</u>			
H_2Dz	1.1×10^4	9×10^{-8}	1×10^{-3}	2.9×10^{-5}	3×10^{-12}	
$\text{Cu}(\text{HDz})_2$	7.3×10^4	8×10^{-9}	5.5×10^{-4}	3.4×10^{-23}	3×10^{-31}	1.0×10^{10} a 1.5×10^{10} b
CuDz	2.0×10^4	$\approx 6 \times 10^{-8}$	$\approx 1 \times 10^{-3}$	$< 10^{-22}$		280

Other Equilibria



a In 1.00 M chloride medium

b In 1.20 M perchlorate medium

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SORPTION STUDIES ON SILICA AEROGEL

(Publication No. 2963)

Edmund Newton Harvey, Jr., Ph. D.
Princeton University, 1941

Summary

The sorption of nitrogen, butane and water on silica aerogel has been studied. The surface area, particle size and distribution of capillaries in this gel have been determined. The sorption of nitrogen at -183°C . denotes the surface area, the sorption of butane at 0°C . is partly surface adsorption and partly condensation in capillaries, the sorption of water between 25° and 100°C is primarily a condensation process. With water, two anomalous effects were noted, a continued slow sorption at low X/M ratios and aging of the gel at higher concentrations resulting in destruction of much of the internal volume. The aging is apparently a chemical coalescence of the gel particles. The results obtained have been compared to other gel-gas systems. Formulas have been derived for quickly determining surface areas from capillary condensation. Silica aerogel has a specific surface of 710 sq. m. per gram, a particle thickness of about 25 \AA and a wide range of capillary sizes with most of the internal volume in capillaries of about 400 \AA diameter. Its surface properties are similar to those of other silica gels but it differs greatly in pore size and volume.

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THE REACTION OF ACYLACETANILIDES WITH FORMALDEHYDE

(Publication No. 2984)

Andrew Bradshaw Jennings, Ph. D.
Princeton University, 1944

New products obtained by reaction of acetoacetanilide and formaldehyde exhibit properties which depend upon the nature of the reaction conditions employed, whereas no such differences are observed in the case of benzoylacetanilide-formaldehyde reaction products. Certain color coupling reactions which are common to some of the products in question and to the aldehyde reaction products of 3-methyl-1-phenyl-5-pyrazolone suggested the possibility that in basic media, acetoacetanilide condenses with formaldehyde to yield a six-membered carbocyclic ring.

In support of such a hypothesis is the work of early investigators in connection with a variety of 1,3-diketones of which acetoacetic ester is an example. Formaldehyde reacts with the latter compound in the presence of basic condensing agents such as piperidine to yield a 1,5-diketone which readily undergoes internal aldol condensation with the formation of a cyclic ketone-alcohol. Under similar conditions, acetoacetanilide gives a stable product which is incapable of undergoing a variety of color coupling reactions which are characteristic of the aldehyde reaction products of 3-methyl-1-phenyl-5-pyrazolone and benzoylacetanilide. Since the latter compounds, as well as their aldehyde condensation products, function similarly in the color coupling reactions, e.g., with oxidized p-aminodiethylaniline, it was reasonable to assume that acetoacetanilide undergoes a secondary reaction after the primary condensation with formaldehyde, and that the product is analogous to that obtained from acetoacetic ester. Confirmation of the identity of the base-catalyzed condensation product of acetoacetanilide and formaldehyde as the

cyclic ketone-alcohol, 3-methylcyclohexane-3-ol-1-one-4,6-dicarboxanilide has been achieved through a series of degradation reactions and the preparation of derivatives.

The primary reaction product of acetoacetanilide and formaldehyde, obtained by condensation in neutral or acidic media, reacts with ammonia to give a yellow dihydrolutidine derivative, whereas the base-catalyzed product was incapable of forming a heterocyclic ring on treatment with ammonia. The probability of a carbocyclic ring structure containing a ketone group is therefore indicated for the compound in question. Dehydration under the influence of anhydrous hydrogen chloride yielded an α, β -unsaturated ketone, and hydrazone formation by reaction with phenyl-hydrazine confirmed the ketone structure of the original compound.

The carbocyclic ring structure was confirmed further by means of a series of degradation reactions in which dehydration is involved. Bromine adds readily, accompanied by dehydration, to yield an unstable dibromide which spontaneously loses hydrogen bromide with the formation of a derivative of *m*-cresol. Hydrolysis with sulfuric acid results in dehydration and elimination of the anilide groups, followed by decarboxylation. The principal products are aniline, identified as acetanilide, and 3-methyl-2-cyclohexen-1-one, identified as the benzoyl derivative of the oxime.

Although the α, β -unsaturated ketone obtained by dehydration should exhibit characteristic ultraviolet absorption, the masking effect of the aromatic substituents completely obscured the ketone absorption bands. The influence of such aromatic substitution upon the ultraviolet absorption spectra of a series of related compounds has been shown.

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THE VIBRATIONAL SPECTRA OF SOME DEUTERO-ETHYLENES

(Publication No. 3413)

John Edgar Lancaster, Ph.D.
University of Minnesota, 1952

The infra-red spectra of four separate isotopic varieties of ethylene have been observed. The first is an almost pure sample of asymmetric $C_2H_2D_2$; the second, a mixture of $a-C_2H_2D_2$, C_2H_3D , and C_2H_4 ; the third, pure $trans-C_2H_2D_2$; and finally, a mixture of *cis*- and *trans*- $C_2H_2D_2$. The general purpose of these observations was to obtain further data so that the determination of the in-plane force constants of ethylene might be determined.

The $a-C_2H_2D_2$ was prepared by electrolysis of an aqueous solution of CH_3CD_2COOH , according to the scheme of Holeman and Clusius [Ber. 70 (1) 819 (1937)]. An assignment of all the fundamental vibrations of this isotope was made. The spectrum of the mixture of the three species $a-C_2H_2D_2$, C_2H_3D , and

C_2H_4 facilitated the identification of C_2H_3D bands in the $a-C_2H_2D_2$ sample, and also led to a complete assignment for the mono-deuterated isotope.

The $trans-C_2H_2D_2$ was prepared by Dr. B. S. Rabinovitch of the University of Washington. This sample was isomerized to a mixture of *cis* and *trans* $C_2H_2D_2$. Partial assignments were possible for the *cis* and *trans* isomers.

The force-constant problem was set up in the valence-force coordinates of Arnett (Ph. D. Thesis, Minnesota [1949]) which were then transformed to symmetry coordinates and expressed in the G and F matrix method of Wilson [J.C.P. 7, 1047 (1939)]. The secular equation ($|\bar{G}\bar{F} - \lambda| = 0$) for the planar vibrations in C_2H_4 factors into one three-by-three block (the totally symmetric vibrations) and three two-by-two blocks (the non-totally symmetric vibrations). The latter are easily solved for the force constants using only two isotopes, C_2H_4 and C_2D_4 . The 3-by-3 block requires the independent information contributed by the $a-C_2H_2D_2$ isomer, and is a much more difficult problem. However, two satisfactory solutions were obtained.

The frequencies of all the isotopic di-deutero ethylenes were then calculated, with good agreement with bands that have been observed. The greatest discrepancy was 1.1%. Complete assignments were then available for all the deutero-isotopes except C_2HD_3 : here the calculation is possible, but was not undertaken in this work.

The method of correcting for anharmonicity used by Arnett (loc. cit.) was extended to the mixed isotopes and for all vibrations which were mainly C-H stretches, so that the frequencies used in the calculation of force constants were "harmonic."

A normal coordinate calculation in the totally symmetric block of C_2H_4 gave evidence for one of the two sets of force constants obtained, primarily from the character of the C=C stretching mode.

Additional evidence was accumulated in favor of the assignment of ν_5 in C_2H_4 to 3075, rather than 3272, which some investigators had favored.

Microfilm copy of complete manuscript of 109 pages, \$1.36. Enlargements 6" x 8", 10¢ per page.

THE INFRA RED ABSORPTION SPECTRA OF ALIPHATIC HYDROCARBONS

(Publication No. 3003)

William Walter McCarthy, Ph.D.
Princeton University, 1946

The vapor phase infra red absorption spectra of butane, isobutane, pentane, isopentane, butene-1, butene-2, butadiene-1,3, and isobutene have been measured in the range 2-16 μ . The data obtained have been used to indicate regions of the spectrum suitable for analysis of mixtures of these various hydrocarbons by infra red absorption methods. This method has been applied to mixtures of butene-1 and butene-2 encountered in specific catalytic and thermal studies of these two compounds.

Furthermore, these infra red spectra were combined with those of a great number of aliphatic hydrocarbons recently made available and, together with their Raman spectra, are discussed in terms of the following subjects.

1. Liquid phase vs. gas phase spectra: It has been found that the spectra measured in the two phases are virtually identical. This is important for assigning modes of vibration from infra red absorption and Raman spectra since the selection rules apply only to the vapor phase.

2. The effect of chain length on the spectra of normal aliphatic hydrocarbons: The number of bands in both the infra red absorption and Raman spectra of the normal saturated hydrocarbons do not increase as would be predicted from theory. The infra red absorption spectra from pentene through dodecane are found to be almost identical. The number of bands in the Raman spectra of the higher members decreases.

3. The effect of chain branching on infra red spectra: Certain definite bands found in the infra red absorption spectra of branched hydrocarbons are assigned to various combinations of methyl groups encountered in these compounds. The spectra of tri methyl substituted octanes contain all the bands which are characteristic of the various di methyl groups from which the tri methyl compounds are derived.

4. The effect of double and triple bonds on infra red spectra: Several bands are shown to be characteristic of the double bond for normal olefins, methyl substituted olefins, and conjugated dienes; and of triple bonds.

5. Raman spectra vs. infra red spectra of the various classes of aliphatic hydrocarbons: The two types of spectra are compiled for many straight chain, branched chain, and unsaturated hydrocarbons. The regions of the spectra associated with the various types of bond vibrations and deformations are indicated, and the spectra are compared in terms of selection rules.

Microfilm copy of complete manuscript of 135 pages, \$1.69. Enlargements 6" x 8", 10¢ per page.

A STUDY OF THE CLAISEN REARRANGEMENT USING RADIOACTIVE CARBON

(Publication No. 3640)

John Peter Ryan, Ph. D.
University of Minnesota, 1952

Allyl phenyl ether with the γ -position labeled with radioactive carbon has been prepared. Pyrolysis of this ether to O-allylphenol has shown conclusively that the rearrangement is accompanied by inversion of the allyl group. This result correlates inversion with the previously established first-order kinetics of the reaction and adds additional evidence for a cyclic mechanism.

Allyl-2,6-dimethyl phenyl ether with the γ -position labeled has been prepared. Pyrolysis of this

ether has shown that the para rearrangement is not accompanied by inversion of the allyl group. Possible mechanisms are discussed. In particular, a two-cycle or a π -complex intermediate mechanism are favored, with the stipulation that the allyl group is never free to undergo "double-bond resonance" during the rearrangement.

Oxidative ozonolysis as a method of structure proof must be used with caution. Ozonolysis of γ -labeled-allyl phenyl ether produced about 70% of an anomalous reaction.

Permanganate oxidation of an aromatic sidechain converts a considerable amount of the α -carbon to carbon dioxide. The oxidation of α -labeled-O-methoxyallyl benzene resulted in the removal of about 12% of the α -carbon as carbon dioxide.

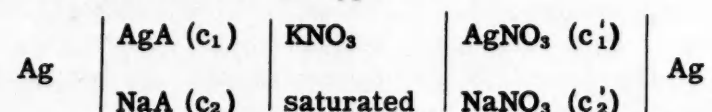
Microfilm copy of complete manuscript of 122 pages, \$1.53. Enlargements 6" x 8", 10¢ per page.

IONIC EQUILIBRIA IN AQUEOUS AND MIXED SOLVENT SOLUTIONS OF SILVER ACETATE AND SILVER MONOCHLOROACETATE

(Publication No. 3575)

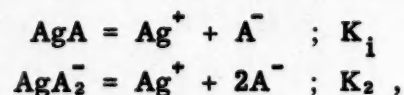
Leo Eli Topol, Ph. D.
University of Minnesota, 1952

An electromotive force study has been made at 25° C. with cells of the type



where A denotes the acetate ion in one set of experiments and the chloroacetate radical in another.

From the measured e.m.f.'s, the stoichiometry of the solutions, and reasonable estimates of activity coefficients, the dissociation constants of the following reactions,



were obtained for silver acetate in 10%, 20%, 30% ethanol-water, and 10%, 20%, and 30% acetone-water mixtures, and for silver monochloroacetate in water, 10%, 20%, and 30% ethanol-water mixtures.

The values of K_1 calculated for silver acetate agree fairly well with those found by Davies and Monk using a solubility method (J. Chem. Soc., 1951, 2718). The variation of K_1 and K_2 with dielectric constant can be well expressed by the Born theory, no specific solvent effect having been found. For silver acetate the influence of dielectric constant on the above equilibria can be represented by

$$\begin{aligned} \log K_1 &= 1.448 - 171.1/D \\ \log K_2 &= 3.25 - 307/D \end{aligned}$$

and for silver chloroacetate by

$$\log K_1 = 0.791 - 113.6/D$$

$$\log K_2 = 2.24 - 219/D$$

As can be seen from these equations, silver monochloroacetate as well as its complex is more highly dissociated than the corresponding acetate in media of dielectric constant 80 or less.

With these values of K_1 and K_2 the solubility product constants computed by previous workers have been corrected. The effect of changes of dielectric constant on these K_1 's for silver acetate can be expressed by

$$\log K_1 = 0.652 - 264/D \text{ for ethanol-water,}$$

$$\text{and } \log K_1 = 1.02 - 293/D \text{ for acetone-water,}$$

acetone producing the more marked lowering here.

Microfilm copy of complete manuscript of 104 pages, \$1.30. Enlargements 6" x 8", 10¢ per page.

A STUDY OF SOME SEVEN-MEMBERED HETEROCYCLIC COMPOUNDS CONTAINING NITROGEN

(Publication No. 3592)

Bernard I. Weissmann, Ph. D.
University of Michigan, 1951

The present study was aimed at the exploration of routes to compounds containing the as yet unknown seven-membered azepine or 1,2-diazepine ring systems. Such compounds, if they could be successfully prepared, would presumably be of interest in connection with the question of the influence of ring size on aromatic properties.

The particular systems whose preparation was attempted were 3-benzazepine, 2,3-benzodiazepine, and an analog of azulene in which nitrogen had been substituted for carbon in the 6-position.

Methylation of 1,2,4,5-tetrahydro-3-benzazepine gave an N-methyl derivative; this, subjected to typical dehydrogenation conditions (palladium-asbestos, 290°), apparently gave ring shrinkage products rather than the desired N-methyl-3-benzazepine. Treatment with N-bromosuccinimide of an N-substituted tetrahydrobenzazepine gave reaction with bromine evolution instead of simple side chain bromination. The new seven-membered cyclic imide, 2,4-diketo-1,2,4,5-tetrahydro-3-benzazepine, was prepared by pyrolysis of the corresponding diamide. Treatment of the imide with phosphorus oxychloride gave 2-chloro-4,5-dihydro-3 (1H)-benzazepine; none of the desired 2,4-dichloro-3-benzazepine was obtained. Preparation of intermediates suitable for cyclization to 1,5-functionally disubstituted tetrahydrobenzazepines was not successfully concluded. One by-product of the last-named attempt was an improved method for preparation of o-divinylbenzene by dehydration of the new bis (β -hydroxyethyl) benzene.

For the attempts at preparation of 2,3-benzodiazepine some o-carbonyl-phenylacetic acids were

desired. o-Acetylphenylacetic acid was prepared by oxidation of 3-methylindene. o-Formylphenylacetic acid was produced by hydrolysis of the urethane resulting from application of the Curtius rearrangement to isochroman-3-one-1-carboxylic acid. (An efficient method for preparation of this lactone-acid was developed). Isomeric products were isolated from each reaction in the dehydration of the phenylhydrazones of the two acids and in the loss of ammonia and carbon dioxide from their semicarbazones. Infra red and ultra violet as well as chemical study of the products of the four reactions, isolated pure and studied, pointed to apparent family relationships, but no structures were conclusively assigned. Some other new compounds prepared in the course of these experiments were w, w, w'-tribromo-o-xylene, o-cyanophenylacetic acid, and o-phenylene-glyoxylicacetic acid.

Treatment with palladium-asbestos at 400° did not induce dehydrogenation of cis-4-aza(5,3,0) bicyclodecane. This cyclic amine and its trans- isomer were prepared by catalytic reduction of cis- and trans-cyclopentane-1,2-diacetonitrile. The cis-dinitrile was prepared by dehydration of the diamide of the known cis-cyclopentane-1,2-diacetic acid. Reduction of trans-cyclopentane-1,2-dicarboxylic acid gave a dialcohol, which was converted to a dihalide; this last gave the desired trans-dinitrile on reaction with potassium cyanide. The yields of cyclic amines and of the diprimary amines simultaneously produced were not significantly different for hydrogenation of the cis- and of the trans-dinitriles.

None of the projected ring systems was prepared; the results suggest, but do not prove, that 3-benzazepine or 6-azacyclopentacycloheptene would possess no considerable aromatic stabilization. A considerable number of new compounds have been prepared and characterized, and improved methods for preparation of some known compounds have been developed.

Microfilm copy of complete manuscript of 129 pages, \$1.61. Enlargements 6" x 8", 10¢ per page.

SOME NEW EXPERIMENTAL RESULTS AND THEORETICAL INTERPRETATIONS IN THE LUMINESCENCE OF SOLIDS

(Publication No. 3066)

Ferd Elton Williams, Ph. D.
Princeton University, 1946

Previous theoretical work on the luminescence of solids has been focused at explaining individual effects. In this thesis effort is directed toward explaining various diverse luminescent properties in terms of a simple model of potential energy versus configuration coordinate. Three states of different multiplicities — a normal, metastable and an emitting state — are involved. The luminescent process consists of the excitation of an electron to the metastable level, the activated release of the electron to

the emitting level, and a forbidden transition between the emitting and the ground state. With high excitation energy the metastable state is bypassed. At high temperatures the electron in the metastable state surmounts a larger potential barrier with a greater entropy increase to undergo radiationless recombination with the activator atom.

Among those significant phenomena that have been measured experimentally and treated quantitatively by calculations based on this model are the temperature-dependence of luminescent efficiency and the effect of type and wave-length of excitation on this temperature-dependence; the three types of phosphorescence - spontaneous, metastable, and recombination phosphorescence; the phenomenon of two-stage afterglow and the effect of type of excitation and temperature on the two stages; the relationship between buildup and afterglow kinetics; and the release of electrons from metastable states by thermal and by optical transitions. The concepts of the Absolute Rate Theory are used to clear up the essential criteria for the different types of afterglow.

A detailed theoretical analysis of "glow curves" is presented and quantitatively applied to improved "glow curves" obtained at linear rates of heating 100 times slower than those previously reported. The slower rates of heating allow one metastable level to be operative at a time. Both monomolecular and bimolecular mechanisms are treated, and it is concluded that "glow curves" result from discrete metastable states that are emptied thermally by predominantly monomolecular kinetics. The explicit expressions for the specific rate constants involved in the release of electrons from metastable states are calculated.

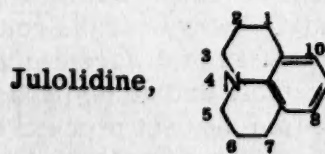
In addition, a number of other experimental results with luminescent materials are announced in this thesis. Among these are the evaporation and condensation in a vacuum of manganese-activated zinc fluoride without the loss of high luminescent efficiency, and the improvement of the efficiency and the existence of fine structure in the emission spectrum of manganese-activated magnesium germanate. The latter effect is qualitatively explained by the theory of Bethe on term splitting by crystal fields.

Microfilm copy of complete manuscript of 126 pages, \$1.58. Enlargements 6" x 8", 10¢ per page.

THE REACTIONS OF JULOLIDINE AND RELATED COMPOUNDS

(Publication No. 3564)

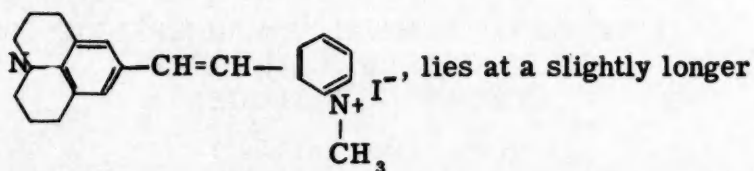
Tung-Yin Yu, Ph. D.
University of Michigan, 1952



a selection of reaction conditions known to lead to

ring-substitution in the case of dimethylaniline. New compounds prepared by direct substitution are: 9-bromojulolidine, 9-benzoyljulolidine, julolidyl-9-thiocyanate, julolidine-9-aldehyde, and julolidine sulfonic acid. Transformation of these initial products led to the additional new compounds: 9-julolidylmethanol, julolidine-9-carboxylic acid, 9-cyanojulolidine, 9-aminomethyljulolidine, 9,9'-dijulolidyldisulfide, and secondary derivatives of these, such as oximes, picrates, and methiodides.

The ease of substitution on julolidine appeared in general to be as great as, and perhaps greater than, that on dimethylaniline. This is in contrast to the known behavior of o,o'-disubstituted N,N-dialkylanilines, which are rather unreactive compared to dimethylaniline. These observations suggest that the 1,3,5, and 7 carbon atoms in julolidine are held in the plane of the aromatic ring, or can readily assume such a position. The absorption maximum in the visible range of the cyanine dye derived from julolidine-9-aldehyde and picoline methiodide,



wave length than the maximum of the dye derived from p-dimethylaminobenzaldehyde, whereas the dye from 3-substituted 4-dimethylaminobenzaldehyde absorbs at shorter wave length. This is in support of the ready assumption of a near-planar configuration by the rings of the julolidine skeleton.

The position and intensity of the absorption of the cyanine dye from julolidine-9-aldehyde is readily understood only if the aldehyde group is attached at the 9-position, as opposed to the 8-position, which is meta to the nitrogen atom. Inasmuch as the other substituted julolidines have either been made from or converted into julolidine-9-aldehyde, the position of substitution in all cases would appear to be the 9-position. As additional evidence, the Emde degradation of julolidylmethanol methiodide, followed by oxidation, gave an acid identifiable as benzene-1,3,5-tricarboxylic acid, which establishes the point of attachment of the carbon atoms.

The construction of fused-ring pyrrolidine and piperidine compounds related to julolidine and lilolidine has been studied by use of the reagents trimethylene chlorobromide, acrylonitrile, and β -chloropropionyl chloride. The use of the first reagent is limited to substances having "activating" groups on the benzene ring. The cyclization of the N- β -propanitriles obtained by the use of acrylonitrile frequently fails, owing in part to de-cyanoethylation. The formation of N- β -chloropropionyl compounds and their cyclization by means of aluminum chloride have been found to be a useful synthesis for saturated rings when followed by reduction with lithium aluminum hydride. By this method julolidine itself has been synthesized, as well as 9-nitro-3-oxo-julolidine, 3a,9a-diazatetradecahydroperylene, octahydro-p-phenanthroline, and tetrahydroquinoline. By use of

chloroacetyl chloride instead of β -chloropropionyl chloride, five-membered rings can be synthesized by this method, as was exemplified in the synthesis of indoline from aniline.

Microfilm copy of complete manuscript of 91 pages, \$1.14. Enlargements 6" x 8", 10¢ per page.

CLASSICS

SHEEP RAISING IN THE WESTERN ROMAN WORLD

(Publication No. 2966)

Eitel Almero John Hayward, Ph.D.
Princeton University, 1942

It will be the aim of the following enquiries to establish in the light of literary, epigraphical, and archaeological data to what extent sheep were raised in Italy and the West; of what economic, social, and political significance the organization of flocks and shepherds were and how the ancient farming methods compare with those of the present day.

The Romans with their primitive economic structure were nearly completely dependent upon agriculture and the raising of livestock. We find an abundance of information about sheep raising in Cato, Varro, Columella, Pliny the Elder, and Palladius.

Aristotle — and later Varro — states that the domesticated sheep was sprung from the wild species, of which the three main types are — first, the *ovis musimo* (Mouflon), found chiefly in Sicily, Sardinia, Corsica, Cyprus, and Spain; second, the *urial* sheep (*ovis tragelaphus*) found in Morocco and Algeria; third, the *Argali* (*ovis arkal*) of Armenia and regions further East.

The climate of Italy concurred with an abundance of desirable grazing to make sheep farming a profitable undertaking. It was particularly during the second century B. C. with the rise of *latifundia* that sheep raising became a specialized and extensive undertaking. During the summer the flocks were kept on the highlands; the winters were spent on the lowlands, in the vicinity of the *villae*. Farmers who did not have sufficient grazing for their sheep let them to a *conductor* who supervised them on some such terms as are found in Cato's *Lex fructus ovium vendendi*.

On most farms in Italy and perhaps at all times at least a small flock of sheep were kept. Pliny mentions two principal breeds, the *oves colonicae* (*oves hirtae*) and the *oves tectae*. The former kind is variably referred to as *oves montanae* — probably because they spent part of the year on the mountains — and was perhaps the native Italian sheep, kept by each *colonus* to furnish his household with wool and milk. The *oves tectae* ("covered" with leather jackets) were the finer breeds, imported originally from the East (mainly by cities in Southern Italy) and kept at the steading the year round.

The most important sheep regions in Italy were Calabria (in particular Tarentum; the *oves tectae* are frequently referred to as *oves Tarentinae*), Apulia (famous for its Canusian weave), Liguria (according to Strabo Liguria produced such an abundance of wool that it "could clothe the greater part of Italy"), Venetia (highly commended by writers of the Empire; Columella claims the first place for the wool of Altinum), and Gallia Cisalpina (Pliny writes that there is no white wool superior to that of the Po districts; up to his day the highest price paid per pound was 100 sesterces). In Gallia Cispadana Mutina and Parma produced fine wool, and in Gallia Transpadana Verona, Brixia, and Mantua. Other regions in Italy which should be mentioned for their wool are Lucania, Bruttium, Samnium, Campania, Latium, Umbria, and Etruria. Sheep, then, were raised in almost every locality.

Sicily, Sardinia, and Corsica were well-known for their sheep from the earliest times. North Africa and Spain with a dry climate and a predominance of hilly pasture offered sheep an ideal home. By the end of the Republic a Spanish ram fetched a talent. Strabo writes that the Gauls were already extensively raising *oves tectae*. Little is known of sheep raising in Germany and Britain; but notices of the British weave and the fulling and dyeing establishments that have come to light on many *villae* would reflect wool production on a considerable scale.

The Romans were circumspect in selecting stud sheep; the sheep's age, shape and size of body as well as the type of wool were considered. Tender lambs were given special attention; at the age of four months they were weaned and castrated a month later.

Apart from the general system of summer and winter grazing the Romans sowed various field crops, such as hay and lucerne, and stored up popular and elm leaves for feed. Varro and Columella give special attention to the supervision of the *oves tectae*. In the works of Livy, Appian, Diodorus Siculus and others we learn of the full significance of the bands of shepherds that terrorized the Roman world during the last two centuries of the Republic.

The flocks were shorn in the spring, special care being taken of the wool of the *oves tectae*; it was washed, combed, and rubbed with wine and oil prior to shearing. In Hither Spain shearing took place twice a year; in Italy and in most other regions only once. The fleeces were classified and wrapped in separate bundles.

Varro, Columella, and Pliny describe the many ailments which sheep were subject to, such as foot-rot, ticks and lice, sore eyes, fever, and scab. It is surprising to find that their remedies for scab correspond closely to the modern dipping fluids which also have sulphur as base.

Besides for their wool and skins, sheep were raised for many choice meat dishes. Lamb was particularly favoured; we hear of shepherds who kept lambs near the city limits to sell them to butchers. From sheep's milk they made sour milk (*oxygala*), cheese, and butter — which was probably always in a liquid form and used in anointing. Columella

states that the manure of sheep is second only to that of asses.

Sheep were important as victims in the Roman sacrifices. Lambs, cheap as compared with larger cattle, were particularly the poor man's offering (*hostiae*). Woollen fillets were widely used in rituals, and worn by matrons and the Vestal Virgins. Wool in the grease (*lana sucida*) was soaked in wine or vinegar and used as a compress.

This ancient and preferred use of sheep and wool in sacrifice would point to a long domestication. From the earliest times in Italy sheep doubtless formed the most important part of the livestock.

Microfilm copy of complete manuscript of 365 pages, \$4.56. Enlargements 6" x 8", 10¢ per page.

STUDIES IN ROMAN EDUCATION

(Publication No. 2989)

Gordon Lincoln Keyes, Ph.D.
Princeton University, 1944

Summary

The education of an individual is the sum of the experience and influences which condition his ability to respond to all the challenges posed by the circumstances in which he finds himself. A study of education in any period, taking cognizance from this point of view of the entire environment and training of the men of the time should offer an approach to the most fundamental questions of history. This Dissertation seeks to begin such a study of Roman education in the Julio-Claudian period by considering two phases of the problem, the educational effect of the public spectacles, and liberal schooling.

The value of public spectacles as a force in education was limited by three factors, their originally religious purpose, their generally unedifying form, and the demands made upon them by the character of the spectators. The Imperial Government, which found rather than invented them, used them as a vehicle of propaganda. The efficiency of the population deteriorated, not only because of the obvious and increasing absorption of time by games, but also because of the cultivation of interests more intense than those stimulated by useful activity. The athletic policy manifested in the games and in the related establishment of a gymnasium by Nero was generally feeble, with bad effect upon professional performer and upon spectator, and with slight effect for good or evil upon its intended chief beneficiaries, the young men of the upper classes. The brutalizing effect, or martial inspiration, of such spectacles as the gladiatorial shows has been overrated, although the *Ludus Troiae* offered its participants some experience of discipline. The drama, music, and horse-racing combined to offer a psychological substitute for activity, and to divert minds from real life to another world of artificial interests. While of immediate advantage to the government, this was a threat to Civilization, because it thwarted and dispersed, rather

than developed, potentialities for useful activity. However, the public spectacles taught their spectators some facts, some application of facts, and to some extent the connection between preparation, efficiency and success.

Liberal education as conceived in Rome was the training which fitted a man for life as a free citizen of an organized society. The activities to which its scope was theoretically limited were agriculture, the army and the service of the state. The liberal schooling dispensed by grammarians and rhetoricians was still more restricted. It was confined to such knowledge of language, literature and rhetorical "science" as was thought essential to effective public speaking. It sought and was fairly successful in attaining limited objectives, and should be judged in relation to the latter, not to the ideal ends of education in general. It offered an elaborate course in public speaking, not a "humanistic" literary training, nor a complete education for public life.

It would be impossible to draw final conclusions as to the effect of these two aspects of their education upon the Roman people without making a complete study of their environment as a whole, of which these aspects form but a moderate part. The chief value of a preliminary study of this sort is that it helps to build up the store of information from which conclusions can finally be drawn when all the evidence has been brought forward. Any suggestions as to cause and effect can be only tentative at this point. But at least it is obvious that public spectacles were a far more important part of Roman education than was liberal schooling. The former was a factor in the daily life of the great majority of the population of Rome: the latter was enjoyed by relatively few, and was at most a very specialized feature in their training. The games were all the more important a force because they stimulated thoughts and interests and conveyed information, which for the most part could not be applied directly in ordinary activity: consequently their effects will be found manifested in unexpected and indirect ways in the character and activity of the people, all the more widespread because lacking a natural channel.

The connection between these two aspects lies only in their being parts of one larger whole, the total training and environment of the Roman people.

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ATHENIAN ACTIVITY IN THE HELLESPONT FROM 600 to 450 B. C.

(Publication No. 2990)

Donald Bernard King, Ph. D.
Princeton University, 1940

Abstract not available.

Microfilm copy of complete manuscript of 102 pages, \$1.28. Enlargements 6" x 8", 10¢ per page.

THE ADMINISTRATION OF THE ROMAN
PROVINCE OF GALATIA FROM
25 B. C. TO A. D. 72

(Publication No. 3043)

William Frederick Shaffer, Ph.D.
Princeton University, 1946

As is stated in the Introduction, this dissertation represents an attempt to study the careers of the *legati* who were charged with the administration of Galatia during the first century of its provincial status as these are related to some of the significant trends in the history of this province and of the Eastern provinces in general.

The section on M. Lollius, the first governor of Galatia, discusses the nature and extent of the province and the few facts about Lollius's administration. The traditional date (25 B. C.) for the formation of the province is accepted, but with some misgivings because of the uncertainty about the era of Tivium, one of its principal cities, and because of the relative poverty of the sources. The reasons for the organization of the province were probably the necessity for better protection of the senatorial provinces in western Asia Minor and the desire to control, for economic reasons, the great trade routes to the East. Pamphylia may have been attached to the new province in 25 B. C. or not long thereafter.

From 25 B. C. to 12 B. C. Galatia, like the other provinces in the East, was governed by Agrippa, probably through subordinate *legati*. The presence in Pamphylia (13 B. C.) of L. Calpurnius Piso, who was probably subordinate to Agrippa, is explained as probably due to a projected campaign against the robber tribes of the Taurus region. When Piso was called to Thrace, he probably held a special command rather than the governorship of Macedonia. It is possible that the famous Tiburtine inscription often assigned to P. Sulpicius Quirinius should be referred to Piso.

P. Sulpicius Quirinius, famous as the Cyrenius who is named by St. Luke as governor of Syria at the time of Christ's birth, probably held, as a *legatus* of consular rank, a special command for his war against the Homonadeis, which is tentatively assigned to the years immediately following his consulship in 12 B. C.

The road-building activity of Cornutus Aquila, who governed Galatia in 6 B. C., should probably be associated with the foundation of the Augustan colonies in South Galatia. Both roads and colonies may have been part of a general plan for the organization of the region. The addition of Inner Paphlagonia to the province at this time was probably connected with the same policy as that which dictated the formation of the original province of Galatia.

M. Plautius Silvanus, a consular *legatus propraetore*, whose presence in Pamphylia is attested by an inscription, may, somewhat like Piso and Quirinius, have had a special assignment against the Isaurians, in A.D. 6. M. Cusinius Rufus and a certain Pupius, who have been named as possible governors under Augustus, are supported by insufficient evidence.

Under Tiberius no governors are known with certainty, but the suggestion by Rostovtzen that certain eponymous officials named in an inscription of the *Augusteum* at Ancyra may have been governors of the province makes it possible tentatively to supply this deficiency. Whether or not these officials were governors, the inscription itself furnishes us with some illuminating glimpses of provincial life in the capital of Galatia during the reign of Tiberius. Of Axius, who is possibly to be identified with L. Axius Naso, proconsul of Cyprus in A.D. 30, almost nothing is known, though he is rather arbitrarily assigned a date under Caligula.

M. Annii Afrinus, known through numerous coins and through an inscription of Iconium to have governed Galatia under Claudius, is thought to have participated in a program which aimed at the creation of a greater loyalty to Rome through the association of the imperial cult with local religion, especially in South Galatia.

Q. Petronius Ueber, the first governor under Nero, if we neglect the highly uncertain M. Ostorius Scapula, was assisted by the procurator L. Pupius Praesens in establishing a boundary between the city of Sagalassus and what may have been an imperial estate at Tymbrinassus.

C. Rutillius Gallicus, *legatus provinciae Galaticae*, was either a regular governor of the province, or a *legatus* subordinate to Corbulo and Paetus, probably the former, if we can accept Gwatkin's theory that these two commanders were not governors. Lucius Sergius Paullus, son of the famous proconsul of Cyprus who bore the same name, cannot be proved to have been a governor of Galatia, but the prominence of his family in "Pisidian" Antioch suggests an interesting field for study.

Calpurnius Asprenas, appointed by Galba to govern Galatia with Pamphylia, probably came to the province as early as A.D. 68 and seems to have made some effort to orient the provincials to the recent changes in the government at Rome. The problem of the difficult "Sospes" inscription is met by a theory that the *legatus* there honored was governor of the province for a short time before the formation of the Cappadocia-Galatia complex, which is regarded as having taken place in the same year, but some months after the addition of Armenia Minor to the Galatian province.

Microfilm copy of complete manuscript of 312 pages, \$3.90. Enlargements 6" x 8", 10¢ per page.

THE SENECA TEMPER IN LUCAN

(Publication No. 3048)

Donald Sutherland, Ph.D.
Princeton University, 1939

Abstract not available.

Microfilm copy of complete manuscript of 138 pages, \$1.73. Enlargements 6" x 8", 10¢ per page.

DAIRY HUSBANDRY

A STUDY OF THE PROGESTATIONAL HORMONE IN THE BOVINE

I. THE EFFECT ON THE MAMMARY GLAND AND LACTATION

II. THE PRESENCE AND ESTIMATION OF A PROGESTATIONAL SUBSTANCE CIRCULATING IN THE BLOOD

(Publication No. 3409)

Donald Louis Hill, Ph.D.
University of Minnesota, 1952

I. A study of some of the effects of progesterone on the bovine mammary gland was made during attempts to induce udder growth and lactation in a Freemartin, two virgin cows, five multiparous cows, and an immature heifer calf. The hormone treatments in general were subcutaneous injections of diethylstilbestrol and crystalline progesterone dissolved in corn oil. Quite conclusive evidence that a progesterone-like hormone(s) is a part of the hormonal complex controlling udder growth was obtained with one cow. This cow had completed one estrogen induced lactation, but a second lactation could not be induced with estrogen until progesterone was incorporated in the treatment. The response by the udder was obtained within twenty-four hours. Additional support that progesterone will cause lobule-alveolar proliferation was obtained with two cows in which estrogen treatment failed to result in high levels of milk production. Including progesterone in the treatment produced an immediate increase in milk production ranging from 3.0 to 5.0 pounds. Four of the animals showed no udder growth responses to the treatments used, and one animal exhibited a rapid udder growth but did not lactate.

II. Effort was extended toward finding a method or methods which would permit the quantitative estimation of the endogenous production of progestational hormone by the cow. Cows' pregnancy urine was assayed for sodium pregnanediol glucuronide using the method of Venning and Browne. Assays for free pregnanediol were made using the methods of Astwood and Jones, and Talbot et. al. Sodium pregnanediol glucuronide and free pregnanediol are either absent from cows' pregnancy urine or were present in quantities too small to be measured by these methods.

Cow blood serum was biologically assayed for progestational activity during one estrus cycle in five cows and following ovariectomy on the 160th day of gestation in one cow using the Hooker-Forbes bio-assay which detects 0.33 micrograms progesterone per ml. The concentration per ml. increased from 1.0 g. the day before estrus to 4.0 - 8.0 g. during the luteal phase of the cycle. Serum obtained the 160th day of gestation in a Jersey cow contained 6.0 g. per ml. and decreased to 1.0 g. per ml. 18 days after ovariectomy.

The corpus luteum is indicated as the major source of the progestational substance by the higher

blood concentrations observed during the luteal phase of the cycle and by the rapid decrease in concentration following ovariectomy during gestation. The corpus luteum is needed for the maintenance of pregnancy in the cow somewhere beyond 160 days.

Microfilm copy of complete manuscript of 101 pages, \$1.26. Enlargements 6" x 8", 10¢ per page.

DAIRY SCIENCE

THE RELATION OF INCIPIENT VITAMIN A DEFICIENCY TO REPRODUCTION IN THE FEMALE RABBIT

(Publication No. 3144)

George Eric Lamming, Ph.D.
University of Illinois, 1951

Studies of various stages of gestation in mature female rabbits were made to determine the effect of low levels of vitamin A on the reproductive efficiency of mammals. As disturbances of the normal reproductive pattern were observed due to incipient or subclinical vitamin A deficiency, their causes were investigated to determine the nature of the abnormality. For the purposes of this study, a state of incipient vitamin A deficiency in rabbits was taken to be present when the blood plasma vitamin A level was below eight micrograms per 100 milliliters and the liver level was below five micrograms per gram of fresh tissue.

One hundred and seventy-nine rabbits were used. Approximately half received adequate carotene or vitamin A while the remainder was fed a ration containing no detectable carotene. The state of deficiency was determined at autopsy by liver and blood plasma vitamin A analyses. No visible symptoms of vitamin A deficiency were observed although extremely low liver and blood plasma vitamin A levels were recorded. In most of the experiments all animals received a vitamin E supplement. However, the similarity of observed abnormalities regardless of the vitamin E intake indicated that the observed symptoms could not be attributed to a lack of vitamin E.

Estrus was inhibited due to incipient vitamin A deficiency, while some animals which mated failed to become pregnant. This reduced by 18 percent the total number of deficient animals which conceived. However, it did not reduce ovulation rate in pregnant animals as indicated by the number of fresh corpora lutea. Ovum infertility and degeneration resulted in a loss of ova before implantation. Thus the litter size was significantly reduced as indicated when deficient animals were autopsied 16 days post coitum.

Incipient vitamin A deficiency resulted in a syndrome of resorption and abortion during late gestation. This reduced the number of normal fetuses present per rabbit 28 days post coitum. It was estimated that in deficient rabbits only 26.4 percent

of original ovulation resulted in normal fetuses at 28 days post coitum compared to 74.6 percent in controls. Ocular abnormalities occurred in Fetuses from deficient rabbits as well as changes in the fetal placenta, which involved a mottled appearance suggestive of fatty infiltration.

Impaired fetal and embryonic nutrition in deficient rabbits significantly reduced fetus sizes at 16 and 28 days post coitum even though the dams appeared in good health.

Bioassay of the gonadotrophic potency of the pituitary glands failed to show significant differences between deficient rabbits with reproductive abnormalities and normal controls. No changes were noted in the histology of the thyroid glands of deficient rabbits. By inference, it was assumed that neither a changed gonadotrophic potency of the pituitary gland nor impairment of the thyroid caused the reproductive abnormalities.

The daily urinary pregnandiol output of deficient and control animals that were pregnant was determined as an indication of progesterin synthesis. Due to wide variations within groups, the results obtained were inconclusive. The similarity of the syndrome of resorption and abortion with symptoms of a lack of progesterone indicated the need for further studies on the relationship of vitamin A to progestins. Possibly the transfer of nutrients across the placental barrier was impaired by incipient vitamin A deficiency.

This investigation has shown that severe reproductive abnormalities can occur due to incipient vitamin A deficiency even though the animals appear in good health. With the exception of the symptoms of abortion, these effects are not visible. Other species may be subject to the same syndrome if the provitamin A intake is seriously reduced for an extended period.

Microfilm copy of complete manuscript of 123 pages, \$1.54. Enlargements 6" x 8", 10¢ per page.

ECONOMICS

MIMIMUM-WAGE LEGISLATION AND ADMINISTRATION IN NEW JERSEY, 1933-1938

(Publication No. 2906)

Allen Eugene Andress, Ph.D.
Princeton University, 1939

Abstract not Available.

Microfilm copy of complete manuscript of 487 pages, \$6.09. Enlargements 6" x 8", 10¢ per page.

FREIGHT FORWARDERS AND THEIR POSITION IN THE FIELD OF TRANSPORTATION

(Publication No. 2936)

Roger Coit Dixon, Ph.D.
Princeton University, 1942

This study of freight forwarders or carloaders has been undertaken because the subject is fast becoming one of general interest to students of transportation. Forwarders constitute the agency¹ which has most recently acquired a status of some importance in the transportation field and, at the present time, public regulation of forwarding companies is under consideration in Congress.

Employment of the forwarding method of operation is limited to the merchandise or less-than-carload field of transportation. The growth of forwarding companies has rendered more difficult a competitive situation in this field which was already unfavorable to the railroads, namely, a struggle for traffic among the railroads, motor carriers, the Railway Express Agency, and to some extent water carriers. It will be seen that the chief competitive fight is between the railroads and the motor carriers, and that the railroads, in an endeavor to recover some of the traffic they have lost to the trucks, have found many means by which to encourage development of the forwarding method. This policy of encouragement has caused the Interstate Commerce Commission to become interested in railroad-forwarder relations, and it has found many of the aspects of these relations to be unlawful. A study of proceedings before the Commission reveals the desirability of radical changes in present methods of handling less-than-carload freight.

The plan of the paper is to present a description of forwarding operations and of what has been called the railroad "l.c.l. problem," and to follow this with a description and analysis of the rail-forwarder relations to which the Commission has objected. Forwarder service is then evaluated by considering its advantages and disadvantages to shippers and carriers. The facts developed in these chapters lead to the conclusion that there is a definite "forwarder problem," and the final chapter considers alternative means that have been proposed for its solution.

1. The term "agency" will be used throughout this paper to denote the various transport methods that are in existence. Thus, in this meaning of the term, there are eight important transportation agencies: railroads, motor, water, and air carriers, pipe lines, forwarders, express companies, and parcel post. The purpose in limiting the term to this usage is to have a convenient term which will distinguish between the method of transport and the companies, or 'carriers,' which perform it.

Microfilm copy of complete manuscript of 320 pages, \$4.00. Enlargements 6" x 8", 10¢ per page.

**COUNTING THE UNEMPLOYED: A STUDY OF
THE METHODS OF UNEMPLOYMENT CENSUSES**

(Publication No. 2938)

John Dana Durand, Ph. D.
Princeton University, 1940

Abstract not available.

Microfilm copy of complete manuscript of 456
pages, \$5.70. Enlargements 6" x 8", 10¢ per page

**AN ANALYSIS OF SOME OF THE EFFECTS OF
TAX RATE LIMITATION IN OHIO, 1910 - 1935**

(Publication No. 2960)

George Henry Hand, Ph. D.
Princeton University, 1939

Abstract not available.

Microfilm copy of complete manuscript of 674
pages, \$8.43. Enlargements 6" x 8", 10¢ per page

**WAGES AND UNEMPLOYMENT
A PRELIMINARY ANALYSIS**

(Publication No. 2971)

Randall Weston Hinshaw, Ph. D.
Princeton University, 1944

The foregoing study is concerned with the effect on the level of employment of changes in wage rates. Throughout the discussion, a condition of severe unemployment is assumed.

Part I is devoted to a statement and preliminary evaluation of current theories relating to the wage-employment problem and to a precise formulation of the problem itself. In the discussion of current theories, chief attention is given to the traditional position that the level of employment is inversely affected by changes in wage rates.

The remainder of the study is a systematic analysis of the effect of wage changes on employment. In Part II, the effect on employment of isolated wage changes (wage changes confined to a single firm) is considered. Three chapters are concerned with the short-run effect of such wage changes on employment within the affected firm, and two chapters are devoted to the long-run effects, the first dealing with the effect of a wage change on the life and size of the firm and the second with the effect of a wage change on the firm's method of production. Attention is directed not only to the effect of an isolated wage change on employment within the affected firm but to the net effect of the wage change on aggregate employment.

Part III is concerned with the effect on employment of widespread or general wage changes. Two main types of widespread wage change are considered: (1) real-wage changes resulting from a change in the level of prices, and (2) widespread or general changes in money-wage rates (which may or may not affect

real-wage rates). In the discussion of general real-wage changes, exchange depreciation, which ordinarily lowers real-wage rates, is compared with widespread reduction of money-wage rates as a method of increasing employment. Widespread changes in money-wage rates are divided into two categories, simultaneous and non-simultaneous, and the effects of each are considered separately.

Part IV is devoted to conclusions. In regard to isolated wage changes, it is concluded that while the volume of employment within the firm directly involved may often be inversely affected by a change in wage rates, employment outside the firm is likely to be affected in the opposite direction, so that the net effect of an isolated wage change on aggregate employment is doubtful. Thus it is conceivable that an isolated wage reduction may increase employment in the affected firm, yet result in a net reduction in aggregate employment, and the reverse can be said of an isolated wage boost. In the case of a general real-wage reduction resulting from exchange depreciation, it is concluded that employment is likely to be favorably affected in the country which depreciates, but it is pointed out that real-wage changes in these circumstances afford no evidence as to the effect of real-wage changes in a closed economy.

In the discussion of widespread changes in money-wage rates, an attempt is made to deal adequately with the dual role of wages as a cost of production and as a form of income. Much attention is given to the implications of price rigidity. It is concluded that in a closed economy (or in an economy in which foreign trade plays a minor role), widespread reduction of money-wage rates during depression is not likely to increase employment and may even further reduce it. This is particularly likely to be the case where prices react slowly to reductions in cost.

Since the effect on aggregate employment of changes in money-wage rates is in almost all cases highly uncertain, it is concluded that the case for money-wage changes should rest, as a general rule, on considerations unconnected with the level of employment.

Microfilm copy of complete manuscript of 202
pages, \$2.53. Enlargements 6" x 8", 10¢ per page.

**AN ANALYSIS OF FOREIGN EXCHANGE
CONTROL PRACTICES: 1931 - 1936**

(Publication No. 2979)

John Richard Huber, Ph. D.
Princeton University, 1937

Introduction

This study deals with the series of special devices adopted during recent years to interfere with the determination of exchange rates and to control the utilization of foreign purchasing power. Devices of this character were applied in more than forty countries but the specific pattern varied widely. In some countries control became an integral part of general monetary and commercial policy and

undoubtedly had far-reaching effects on international trade and other economic activities. In others, it played a relatively unimportant role.

The reasons for adopting control were various. Among these were: to protect the currency in the face of adverse pressure on the balance of payments, to prevent the depletion of gold and foreign exchange reserves, to ensure the satisfaction of vital import needs, and to protect domestic producers from the ravages of economic depression. Probably the chief reason was the protection of the currency. This seemed most imperative in certain central European countries. These countries had but recently experienced extreme inflation and it was thought that if the currency were permitted to leave its gold moorings, this experience would be repeated. Furthermore, it was believed that foreign debt payments would be facilitated by keeping the gold value of the currency relatively high. To maintain the semblance of the gold standard, there seemed no alternative to a policy of restricting outgoing payments. Apparently internal adjustments (i. e., the reduction of domestic prices relative to prices abroad) could not be brought about rapidly enough to permit the continuance of a free gold standard at existing exchange rates.

Seldom if ever have the relative virtues of different monetary policies been more widely discussed than during the past few years. Some students have argued that free currencies, i. e., freely adjustable exchange rates, are superior not only to controlled currencies, but to orthodox gold currencies as well. In defense of free currencies it is argued that internal prices may be kept relatively stable while movements of exchange rates provide the necessary elasticity in the relation between internal and external prices, that adjustments in the balance of payments may be brought about with a minimum of friction, and that international trade may flourish in a world of fluctuating exchange rates. In varying degree the defenders of the orthodox gold standard deny or question these points.

In contrast to the difference of opinion as to the relative merits of paper free currencies, most students agree in condemning the practice of exchange control, especially the elaborate and severe type which has developed in Germany. They contend that such control has restricted rather than promoted international trade, that it has prevented appropriate adjustments between internal and external prices, and that it has perpetuated or aggravated rather than alleviated maladjustments in the balance of payments. However, these judgments have to a considerable extent been based either on particular policies in isolated cases or on theoretical grounds. Until the present no adequate broad consideration of the whole system in its world aspects has been undertaken. It is hoped that the present study may meet this deficiency in part by adding to the general understanding and evaluation of exchange control through a descriptive analysis not of just particular devices in a single country, but of all devices wherever adopted. Today it is possible to view exchange control in terms of a larger perspective. We are now able to see it both in the light of its elaborate development and in the light of possible alternative monetary policies.

This study has been undertaken in full recognition of the difficulties of evaluating specific effects of particular monetary and economic policies pursued within the twisted framework of international trade and financial relations since 1929. In some respects this study is broad in scope, and in some respects narrow. It is broad in the sense that an attempt will be made to describe in some detail the various practices associated with exchange control, to note the problems encountered and the lines of development in control policy, and to point out probable effects of the several devices. Its scope is narrow in the sense that theoretical aspects will be subordinated to the descriptive and analytical aspects. Furthermore, it is beyond the scope of this study to develop in detail the case for an alternative policy to exchange control.

Microfilm copy of complete manuscript of 445 pages, \$5.56. Enlargements 6" x 8", 10¢ per page.

AN ECONOMIC ANALYSIS OF THE INTEGRATION OF CROP AND LIVESTOCK PRODUCTION IN SOUTHERN MINNESOTA

(Publication No. 3661)

Ian Fyvie Keith, Ph. D.
University of Minnesota, 1952

Unlike many other industries, production in agriculture is considerably diversified, many farms producing both crop and livestock products. As a result a problem arises for the farm operator as to the extent to which it may be desirable for him to diversify his production unit by the addition of livestock. This study is aimed at a solution of this problem as it presents itself in southern Minnesota and has as its objectives:

1. To determine the nature of the cost-reducing complementary and supplementary relationships which may arise from the joint production of crops and livestock on farms in southern Minnesota.
2. To determine the extent to which barriers to the expansion of the crop enterprise make it desirable that farm operators in the area should diversify their business by the production of livestock.
3. To determine the relative importance of these relationships to the farm operator in making his decisions as to the keeping of livestock.

On reviewing previous research relating to this problem it was found that this fell into two broad categories. On the one hand there was the basic economic theory of the individual business and on the other hand the findings of farm management workers who have conducted many empirical studies on the farm business. Economic theory suggested two general relationships as giving incentive to joint production. 1) The complementary relationship here defined as any relationship occurring between two or more products in their joint production such that, as resources are diverted from product A to the production of some other product or products, the production of A increases, or tends to increase; and 2) the supplementary relationship here defined as any relationship arising between two or more products

in their joint production, out of their joint use of some factor of production or otherwise, such that a competitive range of production in which the products substitute for each other at diminishing marginal rates is present. It was shown that both these relationships would where present give rise to concave iso-outlay curves and hence give incentive to joint production. The specific production relationships suggested by farm management workers as arising between crops and livestock were then tentatively classified into complementary and supplementary relationships as defined above. It was recognized that, while economic theory suggested that for the individual farm business there was both an optimum scale and an optimum division of resources between crops and livestock, the farm operator in the dynamic situation in which he operates might not be able to reach this optimum.

The general method employed in the study was that of studying a group of farms in which integrated crop and livestock production is present in an endeavour to determine the factors which are of importance in causing this integrated production. Two such groups of farms were used in the study, one in southeast and one in southwest Minnesota. Records were available on these farms and the economic theory previously developed was then used as a basis of evaluation for the empirical data obtained from these farm records. The nature and importance of the various relationships suggested as arising between crops and livestock in their joint production were then analysed under southern Minnesota conditions. This analysis led to the following conclusions.

The most important factors in inducing integrated crop and livestock production in southern Minnesota seemed to be: 1) The presence on many of the farms in the area of labor unused by crop production and having no alternative use but livestock production. 2) The production of crops which are the raw materials for livestock production, particularly of such things as rough fodders and untillable pasture which although of little value as cash crops are of considerable value in livestock production, and 3) the presence of dynamic factors, such as capital rationing, risk, and various institutional factors, which are much greater barriers to the expansion of crop production, than to the expansion of livestock production, by any individual operator. Other factors which undoubtedly provided some incentive to integrated crop and livestock production but which appeared to be of somewhat less importance were: 1) The complementary relationship produced by the stimulating effect of livestock production on crop yields. 2) The supplementary relationship which may arise from the fuller use of capital resources by integrated crop and livestock production, and 3) the possibility of some reduction in uncertainty on integration of crop and livestock production.

Microfilm copy of complete manuscript of 306 pages, \$3.83. Enlargements 6" x 8", 10¢ per page.

REGULATION OF HOURS OF LABOR OF FEDERAL EMPLOYEES INCLUDING EMPLOYEES OF PUBLIC CONTRACTORS

(Publication No. 2987)

Matthew Arnold Kelly, Ph. D.
Princeton University, 1946

The purpose of this study is twofold; first, to supplement existing economic literature on the public regulation of hours of work and, second, to suggest public policy for hours regulations covering federal workers including employees of public contractors. While the recording and analysis of regulations controlling the hours of labor of indirect employees of the Government (workers who are employees of the Government by virtue of their being employed by public contractors) adds to existing literature in this field, there have been few writings other than polemics which are concerned with hours controls for direct employees of the Government.

The study is divided into three parts. Part I describes the legislation and executive orders governing the hours of labor of direct and indirect employees of the Government from the first known statute in 1836 and President Van Buren's executive order of 1840 to the emergency measures of World War II which suspended the federal eight-hour laws, prescribed overtime payments and established minimum workweeks for war industry. Here each regulation is set forth and analyzed as to coverage, objective and effect. The conflict between those who urged the enactment of such regulations to "lead" private industry to introduce "model" hours and overtime standards and those who considered it adequate that the standard established for federal workers differ in no wise from that prevailing in private industry is evident throughout. Chapter I deals with both direct and indirect employees of the Government and covers regulations prior to 1892. Chapters II and III are concerned with employees of Government contractors and direct employees of the Government, respectively, tracing the controls of hours of labor down to 1940. The most significant of the regulations governing employees of Government contractors, the Walsh-Healey Public Contracts Act, is the subject of Chapter IV; while the wartime regulations of hours of labor of both direct and indirect employees of the Government are set forth in Chapter V.

Because these regulations, especially as they pertain to direct employees of the Government, have been nowhere else assembled and analyzed, they have been summarized here in charts totalling 35 pages and set forth as an Appendix. The charts summarize the salient features — coverage, hours and overtime pay standards, expiration date, penalty provision — of each of the regulations from 1836 to date. Each statute and executive order is carefully documented to facilitate the consultation of the original regulation when desired. Because of the number of pages and the size of the charts, the Appendix was bound separately for the convenience of the reader.

The regulations set forth and analyzed severally in Part I are reviewed in Part III in the light of public policy. But the fashioning of public policy for the control of hours of labor necessitates full quantitative knowledge of the workers involved and the hours they work. For this reason, the number of workers employed directly and indirectly by the Government are estimated in Chapter VI and the actual hours worked are recorded briefly — but, it is believed, adequately for the purposes of this study — in Chapter VII. These two Chapters comprise Part II.

Part III, as indicated above, presents a critique of the standards of these controls of hours of labor. Criteria for public policy ought not to be offered without an understanding of the effects likely to result from Government regulation. Accordingly, Chapter VIII, the first chapter of Part III, deals with the economic effects of regulations controlling hours of labor. Wherever possible, the economic effects are related to the federal worker. Furthermore, the emphasis is upon the effects of setting maximum hours standards which reduce hours of work; the present public regulation to increase the length of the normal workday and workweek is an emergency expedient only.

On the basis of the above, it was possible to evolve standards of hours and overtime pay for federal workers including employees of public contractors. The proposal is made to incorporate these standards in a single hours law for all these workers. In the development of the proposal for a single hours law in Chapter IX, the inequities occasioned by the dissimilarity of the standards in (1) the several existing hours laws covering direct and indirect employees of the Government, and (2) the federal hours laws for Government employees and for employees of private establishments doing business interstate are pointed out. Chapter X, the concluding chapter of the study, summarizes the findings in outline form.

Microfilm copy of complete manuscript of 351 pages, \$4.39. Enlargements 6" x 8", 10¢ per page.

THE EXCHANGE EQUALISATION ACCOUNT OF GREAT BRITAIN: 1932 - 1939

(Publication No. 3024)

Lowell Mason Pumphrey, Ph.D.
Princeton University, 1941

Abstract not available.

Microfilm copy of complete manuscript of 293 pages, \$3.66. Enlargements 6" x 8", 10¢ per page.

AN APPRAISAL OF WORKMEN'S COMPENSATION LEGISLATION IN NEW JERSEY

(Publication No. 3028)

Fred Ritchie, Ph.D.
Princeton University, 1942

Abstract not available.

Microfilm copy of complete manuscript of 243 pages, \$3.04. Enlargements 6" x 8", 10¢ per page.

THE JURISDICTION OF THE FEDERAL POWER COMMISSION OVER INTERSTATE COMMERCE IN ELECTRICITY AND NATURAL GAS

(Publication No. 3599)

Theodore Lewis Whitesel, Ph.D.
University of Illinois, 1952

The primary purposes of this study are (1) to investigate the extent of the Federal Power Commission's jurisdiction in relation to the States over interstate commerce in electricity and natural gas, and (2) to determine whether or not the Commission's jurisdiction over interstate commerce in electricity and natural gas affords an adequate basis of regulation of the electric and natural-gas industries in the national interest. The study is secondarily concerned with the extent and adequacy of the Commission's authority under the Federal Power Act and the Natural Gas Act to regulate particular activities of utility companies subject to the Commission's jurisdiction as a consequence of operations in interstate commerce.

The principal sources of information for the study are government documents, Federal Power Commission and State commission decisions, and Federal and State court decisions. The method of presentation of information is both descriptive and analytical.

The extent of the Federal Power Commission's jurisdiction over interstate commerce in electricity and natural gas depends upon the provisions of the Federal Power Act and the Natural Gas Act and the interpretations placed upon these statutes by the Commission, United States Courts of Appeals, and the United States Supreme Court. Decisions of the Commission and the courts in jurisdictional cases are considered fully in the study as to whether or not they comport with the intent of the Congress in enacting the Federal Power Act and the Natural Gas Act and with decisions of the Commission and the courts in other jurisdictional cases.

The study reveals that the Commission's existing jurisdiction over interstate commerce is not an adequate basis of regulation of the electric and natural-gas industries for the protection and advancement of the national interest in these industries. The Federal Power Commission should have jurisdiction over intrastate commerce and over facilities employed in generation of electricity to the extent necessary to bring about the integration of electric supply systems on a regional scale. Its jurisdiction should be extended to sales of electric energy in interstate commerce to industrial consumers by "public utilities" to permit it to remove discrimination between rates for such sales and rates for wholesale sales. It should be permitted to regulate rates for intrastate wholesale sales that are made jointly with interstate wholesale sales by means of given generating facilities. The provision in the Federal Power Act permitting States to prohibit the exportation to other States of hydroelectric energy generated at State licensed dams should be eliminated.

The relatively short life of natural gas reserves

makes necessary that the Commission be empowered to put in force a national policy of conservation of natural-gas supplies. This policy should distinguish between "superior" and "inferior" uses of natural gas and should give consideration to the interests of producer States in the curtailment of the exportation of natural gas to other States for industrial uses. The Federal Power Commission should be granted the necessary jurisdiction to withhold and to condition certificates of convenience and necessity for the prevention of wasteful uses of natural gas, to regulate rates for direct sales of natural gas to industrial users and to utilities for use as a boiler fuel in the generation of electricity, and to regulate contracts between "natural-gas companies" and distributing companies for the purpose of prohibiting the resale of natural gas for wasteful uses. The Commission should have complete jurisdiction over sales of natural gas in interstate commerce by independent producers and gatherers during the process of production and gathering and should have authority to regulate the transfer of natural-gas reserves by integrated pipeline companies where such reserves are pledged to interstate service.

Microfilm copy of complete manuscript of 1308 pages, \$16.35. Enlargements 6" x 8", 10¢ per page.

THE PRINCIPLES AND PRACTICES OF PROFIT SHARING ILLUSTRATED FROM THE PROFIT SHARING PLANS OF THE EASTMAN KODAK COMPANY, THE PROCTER AND GAMBLE COMPANY, SEARS, ROEBUCK AND COMPANY

(Publication No. 3070)

Richard Harvey Wood, Ph.D.
Princeton University, 1943

The major purpose of this thesis is to assess public policy on profit sharing. Profit sharing has fallen from the position of high esteem it formerly held. Profit sharing may, however, serve a useful purpose in certain situations. With these considerations in mind, the records of three of this country's oldest and most "successful" profit sharing plans are examined.

Two questions are raised and examined in the introduction. First, is profit sharing possible in our economy? Second, even if possible, is profit sharing advisable?

Although the sharing of profits without commensurate loss-sharing would be impossible under conditions of pure competition, it is clear that we are here dealing with quasi-monopolistic enterprises. These three firms, therefore, have been able to share profits with their employees, and there seems to be little question that they have, in fact, been doing so.

The increases in wages and corporation taxes during the past decade have tended to undermine the companies' quasi-monopolistic earning power. No one of them, however, has as yet suffered such a decline in earnings as to threaten, seriously, its ability to keep its plan in operation.

Whether the sharing of profits is advisable depends on the objectives of the plan and on the degree in which they are attained. The objectives may generally be classed under five headings:

1. Provision of a means of expression for the management's altruism. This objective runs into two major obstacles: first, the dislike of many workers (and especially their unions) for "paternalism"; and, second, the question as to whether the corporation's altruism is "pure," i. e., whether the workers get what they deserve under any given profit sharing plan. Each of the three concerns examined now places a great deal more emphasis on the "good business" than on the altruistic approach to its plan.

2. Distribution of the fruits of industry more "equitably" (i. e., more equally). Idealists have hoped that profit sharing would lead to such a redistribution of wealth and income as would ultimately end the conflict between labor and capital. Although some of the older workers have, under each of these three plans, become "capitalists," wages still remain the main source of income for the great majority of the employees.

3. Decrease in the Rigidity of Wages. Since it is claimed that the leads and lags in prices greatly aggravate the effects of booms and depressions, would profit sharing serve a useful purpose if it made wages more flexible? Or, on the contrary, should wages be kept steady while the prices of the other factors of production are brought under control? The effect of these three plans is probably to increase the flexibility of wages above, but not below, the "going rate."

4. Provision of Security for the Workers. The basic needs of the workers are quite steady, while profits are characteristically unsteady. Therefore, profit sharing is a poor means of providing for the security of the worker, especially if the economy is viewed as a whole. The Social Security Act has greatly improved the position of the employees of these, as of other, concerns in this respect.

5. Increase in the Efficiency of the Labor Force. The "general loyalty" of at least some of the workers may be increased if they feel, for any reason, that the plan benefits them. The traditional idea that a "sharing" of profits will cause the workers to work more efficiently may be valid in a few cases, but is hardly applicable to modern large-scale industry. The principal objective common to these three plans appears to be to decrease labor turnover; and, although the results cannot be accurately measured, it seems probable that this objective has been, at least in part, attained. It is felt that, on balance, the use of a profit sharing plan to attain this objective is sound. It is suggested, however, that corporations would generally do well to seek out and remove the more fundamental causes of excessive labor turnover among their employees before attempting to reward length of service by profit sharing.

The thesis gives a detailed analysis of the features and recent development of the specific plans used as illustrations of profit sharing, and relates these features and this development to the general principles posited in the introductory chapter.

Microfilm copy of complete manuscript of 230 pages, \$2.88. Enlargements 6" x 8", 10¢ per page.

EDUCATION

THE RELATIONSHIP BETWEEN PERIODICAL
FICTION AND THE RISE OF REALISM IN
THE UNITED STATES: A STUDY OF
SCRIBNER'S MAGAZINE, 1887 - 1939

(Publication No. 3611)

William Everet DeClark, Ph.D.
New York University, 1951

The Problem

The purpose of this investigation was to discover the relationship between the fiction of such a representative literary periodical as Scribner's Magazine and the growth of realism in the United States between 1887-1939.

Procedure

The study was approached by means of a panel group of well-known American literary critics and historians. From their works were extracted and tabulated in chart form the titles of what these authorities considered the most significant pieces of realistic fiction printed in the United States during the publication span of Scribner's. The fiction of Scribner's was then read in order to learn (a) What writings listed on the panel chart of realism were originally printed in Scribner's, (b) What other advances in realism Scribner's might have made either in its fiction or through editorial encouragement, (c) How the realism of Scribner's compares in chronology, subject matter, or technique with the realism printed simultaneously in non-Scribner's sources.

Results

A reading of all Scribner's fiction in chronological order showed that in 1887, the year of its origin, this magazine was a leader of American realism with its publication of Harold Frederic's Seth's Brother's Wife and H. C. Bunner's "The Zadoc Pine Labor Union." Frederic's novel is one of the earliest protests against the sterility of small town life, whereas Bunner's story opened the field of labor relations to fiction.

From 1888-1890, Scribner's contributed to realism by printing "Gallegher," by Richard Harding Davis. This writing introduced the Irish immigrant to fiction, and also helped to simplify prose style. Between 1891-1895, Scribner's again aided realism by printing the first fiction of Edith Wharton, since noted as the earliest major writer to penetrate the mind and manners of the social elite of New York City.

For Scribner's, the years 1896-1900 were productive of no initiating realism as selected by the panel group. Nevertheless, of unusual merit was "The Open Boat" by Stephen Crane. This work has been described as the first clear demonstration in short fiction of Zola's naturalism. During 1901-1905, Scribner's again failed to earn a place among the panel choices, although the magazine did print two fine pieces of realism in Willa Cather's "A Death in the Desert" and Wharton's House of Mirth. Both stories are revelatory of the inner nature of women.

From 1906-1920, Scribner's closely reflected rather than led the age in realistic fiction. In the half-decade of 1921-1925, however, it gained noteworthy success by introducing F. Scott Fitzgerald and Thomas Wolfe to the reading public. Fitzgerald led the "Jazz Age" in fiction, and Wolfe championed the young writers who immediately followed the Lost Generation. After 1925, Scribner's achieved almost complete realism in the majority of its stories, but few of its selections were outstanding, according to the panel group. From 1932 onward, until its bankruptcy in 1939, Scribner's fiction declined into trivia.

Conclusions

Two general conclusions were reached in this study. First, during its earlier and later history Scribner's was one of the leaders of realistic fiction printed in the United States. Second, an analysis of publication sources and other evidence shows that between 1887-1939, magazines have been the chief discoverers of American realism, but that book houses have produced the greater number of enduring works of realism.

Recommendations

From the findings made through this study, it is recommended that further projects in realism be devoted to an examination of individual American literary magazines. The conclusions drawn may tend to elevate the status of periodicals over books in the shaping of American fiction.

Microfilm copy of complete manuscript of 340 pages, \$4.25. Enlargements 6" x 8", 10¢ per page.

CURRENT DEMOCRATIC METHODS OF
TEACHING ON THE SECONDARY SCHOOL LEVEL
IN THE UNITED STATES - A SURVEY OF
CLASSROOM TEACHING PRACTICES REPORTED
BY TEACHERS IN A QUESTIONNAIRE AND
SUPPLEMENTED BY CLASSROOM VISITATION
AND OBSERVATION DURING THE SCHOOL
YEAR 1950 - 1951

(Publication No. 3613)

Grayce A. Foley, Ed.D.
New York University, 1952

The problem of this investigation may be stated generally as follows: To discover some current democratic methods of teaching which are being used on the secondary-school level in the United States and to interpret their implications for teaching practices. The study was undertaken for two purposes mainly. The first concern is to produce a helpful methods handbook in the form of a yearbook to be used as a guide by teachers who are interested in keeping up-to-date on democratic practices. The second objective is to show how better learning takes place when democratic practices are followed by the teacher and pupils in the classroom.

Two basic procedures form the foundation upon which this study is built. First of all, the literary

approach, involving a survey and interpretation of authoritative references, established a background for the definition, identification, and use of democratic teaching methods in relation to the philosophy of American democracy. From the survey of the writings on democratic teaching, four perplexing problems recurred in the discussions and protuberated as the vital concerns of teachers. In turn, this study considers the following facets of democratic teaching:

1. Identifying democratic methods of teaching.
2. Solving problems in the use of democratic methods.
3. Presenting democratic methods of evaluating pupils.
4. Considering the outcomes of democratic teaching.

Secondly, new instruments of research were created in the questionnaire, interview, and observation forms, in order to canvass the current scene by contacting select secondary-school teachers throughout the country and gathering their opinions and descriptions of the democratic teaching process based on the use of democratic methods. The study, therefore, reflects the degree to which democracy is practiced on the secondary-school level and the unlimited possibilities for the advancement of learning via the workings of democracy in the school.

Findings indicate that democratic teaching is more a manner than any special method of instruction. Since a democratic philosophy pays eternal tribute to the dignity of the individual human personality, and the democratic teaching process fosters a unique cooperative teacher-pupil learning situation, no one set of plans, methods, or approaches can be quoted adequately as the outward marks of an infallibly democratic procedure. Hence, there is no bound to the amount of experimentation and development of democratic techniques nor limit to the facets of application of democratic principles in the classroom.

The study reveals that the teachers using democratic methods are enthusiastic about their work, convinced of the worthwhileness of democratic practices and, furthermore, are desirous to give and receive advice and help. Since there is no official organ devoted to democracy in secondary-school teaching methods, this study is an attempt to establish a methods yearbook to be supplemented annually.

In retrospect, this study covers the four main phases of democratic teaching methods as they are used throughout the country. The appendix serves as an initial directory of teachers who are working with these methods. Further volumes may be devoted to a more specific study of methods in one edition, problems in another, evaluation techniques, and outcomes in still other studies. New angles of research are yet to be developed. Regardless of the specific approach, it is definite that more publicity and prominence should be given to pedagogical studies in a way similar to the research discoveries in medicine and science, so that new endeavors may mount and form a path for the constant march of progress.

Microfilm copy of complete manuscript of 502 pages, \$6.28. Enlargements 6" x 8", 10¢ per page.

THE EDUCATIONAL VIEWS AND INFLUENCE OF SAMUEL KNOX

(Publication No. 3614)

Ashley Foster, Ph. D.
New York University, 1952

Samuel Knox (1756-1832) was a propagandist for a universal system of public education during the initial turbulent and precedent-making post-Revolutionary years of the United States. His ideas on universal public education, incorporated in his *Essay on Education*, reflected ideas on the nature of man which he held in common with the Jeffersonians.

After a revolution which saw America pledged to the doctrine of all mankind's being created equal and dedicated to the preservation of "life, liberty and the pursuit of happiness," education was, for the majority of Americans, a make-shift and haphazard affair. No organized or concerted effort was made to ensure the perpetuation of national ideals through widespread systems of public education. Even state-wide systems were not effected until the nineteenth century was well under way. This failure is attributed here to the ruling classes' lack of faith in the ability of the common man to preserve his political ideals and, as a result, an insensitivity by them toward an educational system whose justification stemmed from a faith in man and democratic institutions.

Knox and many Jeffersonians — among them members of the American Philosophical Society of which Jefferson, himself, was president — regarded universal education as the best means of preserving the uniquely American ideals, and to this end, the American Philosophical Society by offering a prize, and Samuel Knox by his consistent pamphleteering, sought to raise the educational level of Americans.

In the *Essay on Education*, his outstanding work, Knox proposed a uniform system of education to be graded from the elementary school through the National University; parish schools, county academies, state colleges and a single National University were to constitute the national school system. The children of rich and poor alike were to receive an education. However, the education of the latter was to be increasingly selective with ascent of the academic ladder; thus, of the nation's poor children only the most talented would eventually receive a free public-supported university education. This is strongly reminiscent of the Jeffersonian ideal of an aristocracy of talent. To prevent economic wastage, however, Knox proposed that these talented poor children who received something less than a university education at public expense be utilized as a source of well-educated teachers. Knox's comprehensive scheme anticipated future developments in education by its proposal of a uniform graded system, a standardized curriculum and textbooks and a non-denominational approach to religion in the public school.

Other educational essays by Knox proposed state subsidization of the academies as nurseries for college material (*Essay on Education*, Introduction, 1799), state certification of teachers and a teacher-security program (*Essay on the means of improving*

public instruction, 1803), and an ingenious modification of Lancastrianism to make it applicable to higher as well as elementary education (*Essay on Education*, 1826).

Although Knox was a relatively well-known educator in his time — he was offered the first professorship of the University of Virginia by Jefferson in 1817 — his educational efforts yielded few permanent results. He was a practicing pedagogue and as such he worked to alter contemporary attitudes to favor universality in public education. It is, however, as a man of his time rather than as a figure for all time that Knox deserves recognition. In a period conspicuous by lack of evident activity in practical pedagogy, Knox appears to have been outstanding for his own original thinking as well as for his educational translation of the contemporary Jeffersonian ideals.

Microfilm copy of complete manuscript of 222 pages, \$2.78. Enlargements 6" x 8", 10¢ per page.

**A SOCIAL STUDIES SYLLABUS FOR SECULAR
TEACHERS IN JEWISH ALL-DAY SCHOOLS:
A COMPANION BULLETIN TO THE SOCIAL
STUDIES CURRICULUM BULLETINS OF
THE BOARD OF EDUCATION OF THE
CITY OF NEW YORK**

(Publication No. 3616)

Samuel Goodside, Ed. D.
New York University, 1951

The Problem

The purpose of this study is to prepare a syllabus for secular teachers in Jewish all-day schools which give the teacher of social studies the instructional materials of Jewish life and culture that he requires in the teaching of the subject.

Background

Jewish all-day schools are different from public and non-sectarian private schools in our country. Although they cover the same ground as these schools, they also deal with a specific culture and have a definite philosophy not provided by public education. To help justify the value and the need for such a syllabus on the part of the secular teacher in the Jewish all-day school, the author corresponded with fifteen educators in the fields of general and Jewish education requesting an opinion as to the need, the potential value, and the probable effectiveness of such a syllabus. Thirteen educators from the following cities not only replied in the affirmative but also welcomed such a study: Albany, Cincinnati, Cleveland, Newark, New York City, and St. Louis.

This need was clearly emphasized in the Report of the Committee on the Study of Teaching Materials in Inter-Group Relations prepared for the American Council on Education in 1949. The Committee recommended adequate and accurate information and materials about the Jews as a group and their position in American society. In addition, it stressed the

need for a description of the cultural achievements and contributions of the Jewish people as well as for a treatment of their role in United States history which would be balanced topically and chronologically.

Procedures

The syllabus is prepared as a companion to the Social Studies Course of Study of the Board of Education of the City of New York, released June 1, 1950. Though primarily intended for use by teachers of secular subjects in the Jewish all-day schools, it may also be used by others in general education who wish to demonstrate the role of the Jewish group in the growth of our country. Changes were not made in the New York City Course of Study, but rather, Jewish content and materials were added to those sections which lent themselves to correlation.

To offer an integrated whole, the original material found in the New York City Course of Study appears in bold capital type. Dovetailed therein, in regular type, appear the objectives, content materials, teaching techniques, outcomes, and evaluative treatment of the addenda. The three levels of gradation are: Kindergarten, Grades One and Two; Grades Three and Four; Grades Five and Six. For the teacher, there are sections on how to use the syllabus, source material and resources, and an appendix containing selected materials essential to a fuller understanding of some of the content.

The syllabus developed from the inter-action and cooperation of a three-way working team consisting of the author, the sponsoring committee, and a jury of five educators in the fields of Jewish education, general education and administration, teacher training, curriculum construction, and social studies. The author selected those areas of the New York City Course of Study approved for correlation after many conferences with the jury. The same method applied in the selection of the Jewish content. Some aspects of the present study were tested for several years in the classrooms of the Ramaz School in New York City which is a prototype and model for Jewish all-day schools in the United States.

Summary and Implications

The present study provides teachers of secular subjects in Jewish all-day schools, in particular, and those in general education, in general, with a teaching aid which demonstrates the nature of the Jewish group and its contributions to our American heritage. It offers a study of Jewish culture which may balance a social studies program of study. It also implements the recommendations of the American Council on Education.

It may at the same time suggest to students of other minority groups a significant way in which they, too, may demonstrate the role of their group in the American way of life. Eventually a syllabus such as this may be prepared for each group, which should be of great value to some future course of study for New York City which has so many minority groups.

Microfilm copy of complete manuscript of 304 pages, \$3.80. Enlargements 6" x 8", 10¢ per page.

THE RELATIVE EFFECTIVENESS OF TWO METHODS OF TEACHING WRITTEN AND SPOKEN ENGLISH (COMMUNICATION)

(Publication No. 3566)

Russell Lowell Jenkins, Ed. D.
Michigan State College, 1951

This experiment was conducted to evaluate the relative effectiveness of traditional and the teacher-counselor-advisor methods of teaching the communication skills (speaking, writing, reading, and listening) in Basic III, Department of Written and Spoken English, Michigan State College.

The problem was to discover the relative effectiveness of these two methods of teaching knowledge and skills of communication within the limits of the objectives and certain other prescriptions for the Basic III course. Traditional methods (those commonly used in these and other classrooms) were those normally used by the participating instructors, in which the teacher plays the dominating role in an authoritarian classroom atmosphere, and which consist of lectures by the instructor and teacher-question-student-answer recitations. No effort is made to maximize student participation and involvement in the learning process and in the classroom procedures. The teacher-counselor-advisor method places the teacher in the role of a "democratic strategist" who is a consultant, resource person, adviser, stimulator, creator of learning situations, and a counselor, in permissive and democratic atmospheres. Maximum student participation and involvement in the learning process and in the classroom procedures is obtained by group work and "discussional" techniques.

Four instructors and eight classes of written and spoken English participated in the experiment the Fall Quarter, 1950. Four of these classes were the control group taught with the traditional methods of these instructors. The other four classes were the experimental group taught by these same instructors using the teacher-counselor-adviser method as designed for this experiment.

The eight classes used in the study were composed of students randomly enrolled in these classes during Fall registration, 1950. The specific classes were those which were scheduled to meet during the class periods 8-10, 10-12, 2-4, and 4-6 on the same days of the week. A control class and an experimental class met during each of these class periods. The average class size was 28 with a maximum range of 27-29 for these eight classes.

Sixteen students, randomly selected from each of these eight classes, a total of 64 control cases and a total of 64 experimental cases, were selected from the eight classes. These groups were compared by test scores on the American Council on Education Psychological Examination, and the Cooperative English Test for Reading Comprehension Test C2: (Higher Level) Form Y for controlling the variables of ability and reading comprehension. The comparisons were made by analysis of variance to determine any significant difference between these two groups as indicated by these test scores.

The three communication achievement criteria (the speech, the theme, and the objective examination) used by the Michigan State College Board of Examiners for the Basic English Comprehensive Examination were used as pre-tests and post-tests to obtain gain in achievement in these skills. The post-test scores from each achievement criterion were statistically adjusted for difference in initial ability in these communication skills. The scores from these achievement criteria were statistically analyzed by analysis of covariance to determine if significant differences in achievement gain existed, and to determine if any significant difference in achievement gain could be attributed to either the method of instruction, and difference in instructors, or the interaction between instructors and methods of instruction.

Certain subjective data from a sociometric questionnaire, the Student Opinionaire, and the Teacher Evaluation were obtained for analysis of student changes within the social structure of the classroom and analysis of student evaluation of procedures used in these classrooms.

The results of the experiment indicated that differences, in gain of achievement for the communication skills, attributable to the method of instruction were not significant differences. The experimental group showed a slightly greater gain in speech and a somewhat greater gain in the combined skills, while the control group showed the greater gain in writing which approached significance at the five per cent level of confidence.

Further results showed the gain difference attributable to instructor effect was significant for these instructors in the teaching of speech, but not significant for either writing or the combined skills. No gains attributable to instructor and method interaction were found significant.

The subjective responses showed fewer isolates and more changes from isolates to non-isolates for the experimental group than for the control group. The experimental group responses seemed to indicate that they had more accurately sensed the purpose of the course, believed more fully that the course had stimulated individual thinking, and had more critically evaluated the instructor and his procedures than had the control group. Eighty-three per cent of the experimental group's favorable responses pertained to specifics involved in the experimental procedure. Thirty-three per cent of this group's unfavorable responses pertained to these specifics.

Some traditional methods and the teacher-counselor-adviser methods of teaching communication skills seem to achieve about equally good results in achievement in these skills.

Microfilm copy of complete manuscript of 209 pages, \$2.61. Enlargements 6" x 8", 10¢ per page.

RELIGIOUS PROGRAMS IN SELECTED PROTESTANT CHURCH-RELATED COLLEGES

(Publication No. 3631)

Paul Everett Mininger, Ph.D.
University of Pennsylvania, 1949

The Problem

The present investigation was undertaken on the assumption that one of the first requirements in the clarification of the religious function and the improvement of religious programs in Protestant church-related colleges is a thorough understanding of the procedures followed and problems faced by those colleges which have taken their religious purpose seriously and have developed a religious program. The problem, therefore, may be stated as follows: To discover and present in detail the main facts regarding the religious programs in a selected group of Protestant church-related colleges.

Answers to the following questions are sought:

1. What are the religious purposes of the selected colleges?
2. What are the practices that prevail in the organization and administration of their religious programs?
3. What are the major problems that arise in providing religious programs at these colleges?
4. What are the implications of these facts for the further development of religious programs at Protestant church-related colleges?

Procedures

Nineteen colleges were selected for study. They were recommended by secretaries of church boards of education and other leaders in Christian higher education as being colleges which provided superior religious programs. The colleges are affiliated with ten different denominations, and are located in eight different states in the territory of the North Central Association of Colleges and Secondary Schools. The enrollment in the colleges ranged from 267 to 1960 students.

The data concerning the religious programs of the colleges were collected by the investigator making a personal visit to each of the colleges. A set of schedules was prepared for recording detailed information about the various elements in the religious program of each college.

After the data were collected and tabulated the specific items were then examined with reference to their universality or variation among the colleges studied. The exact nature of the procedures used and their relationship to other phenomena in the college environment are noted. The method of treatment is an intensive analysis of the course of experience in a few situations and the focus of attention is constantly upon the nature and function of the activities, the discovery and definition of basic problems and the identification of what seem to be the main factors that condition the solution to these problems.

Conclusions

A careful analysis of the data revealed that six

functions or processes were used in the religious programs of the nineteen colleges. These functions are as follows:

1. Instruction and study.
2. Worship.
3. Fellowship and participation in a Christian organization.
4. Christian action.
5. Religious counselling.
6. Control and administration.

As a result of the study four major issues emerged and were clarified. These are considered crucial because the answer which is given to them will probably determine whether or not the Protestant church-related college will survive as a distinctly Christian institution. These emerging issues together with related questions are as follows:

1. What should be the religious objectives of the Protestant church-related college? In rethinking their religious objectives colleges will need to clarify at least three other issues.
 - a. What is the religious faith to which the college is committed and which it is seeking to develop in its students?
 - b. What is the relationship between the basic religious faith of the college and the liberal arts ideal of education?
 - c. What is to be the relationship of the college to institutionalized Christianity as found today in local churches, in organized denominations and in the ecumenical movement?
2. What are the most effective methods of processes by which a college community can achieve its religious objectives?
 - a. How can the Christian world and life view become the unifying center for the entire program of the college?
 - b. What principles have been learned from past practice as to how the Christian faith is communicated?
 - c. What can the modern science of religious education contribute to an understanding of the best methods of achieving the religious objectives of the college?
3. How shall these processes be organized into a functioning religious program?
 - a. How shall the processes be organized so that they are related and can supplement each other?
 - b. How shall the various functions be distributed among the three groups interested in the religious development of students — the college, the student religious organizations, and the local churches?
 - c. Can a college provide an effective religious program and at the same time maintain all the other curricular requirements and extra-curricular activities that are a part of most college programs today?
4. What are the next steps in the improvement and development of religious programs in Protestant church-related colleges?
 - a. Denominational boards of education, boards of trustees of colleges, together with college

administrators and faculties will need to give prompt attention to the issues stated above, if the church-related college is to survive as an effective instrument of the Christian movement in the modern secular world.

b. The development of an adequate religious program for Protestant church-related colleges will also require a cooperative program of study, research, and planning, which will cost money and will require manpower. Opportunity for such effort should be provided by such organizations as the National Protestant Council on Higher Education, the Commission for Higher Education of the American Association of Colleges and the National Council on Religion in Higher Education.

c. There is also need for a few church-related colleges which have the resources of men and money, to experiment with new ideas and plans in the further development of their religious programs. This experimentation should be encouraged and should be carried on in close cooperation with the cooperative research and study projects.

Microfilm copy of complete manuscript of 437 pages, \$5.46. Enlargements 6" x 8", 10¢ per page.

THE ACTIVITIES AND CONTRIBUTIONS OF HENRY R. PATTENGILL TO EDUCATION IN MICHIGAN

(Publication No. 3569)

James Geoffrey Moore, Ph. D.
Michigan State College, 1951

The purpose of this study was to present a biographical account of Henry R. Pattengill's educational activities in Michigan. Pattengill's philosophy from his early teaching days until his death was analyzed and evaluated. In addition, his activities in education were described and evaluated. The evaluation of these activities and his philosophy was made in terms of the contributions and influences they had on education in Michigan.

This was an historical study in which two types of sources were used. First, there were the primary sources consisting of family papers and letters, his educational and current events journal, his books, governmental documents, legislative acts, minutes of the Michigan State Teachers' Association, and personal interviews with those who knew Pattengill or had heard him speak. Second, there were the secondary sources, such as magazines, newspapers, educational encyclopedias, and county histories.

In the field of education, he was a public school teacher and administrator, educational journalist and publisher, chief state official, and public speaker. In the four areas of education, journalism, leadership, and oratory Pattengill's educational experiences as a student in the public schools and college laid the foundation for his life work.

During Pattengill's experience as a public school teacher and administrator, he was a believer in

faculty psychology, a proponent of essentialism in educational philosophy, and a strict disciplinarian. In the administration of schools he believed pupils and parents should be informed, but should not have an active part in administering them.

Pattengill's papers, *The Michigan School Moderator*, *Timely Topics*, and *Moderator-Topics*, served as means for communication between teachers, as official publications for the Michigan State Teachers' Association, the Department of Public Instruction, and The Schoolmasters' Club, as a way for disseminating educational information, and as a vehicle for Pattengill's ideas and programs for educational improvements. The books he compiled and published were designed to meet the needs of the educational scene in Michigan as Pattengill saw them. In neither papers nor books did Pattengill give evidence of much original thought.

During his two terms as Superintendent of Public Instruction, he was instrumental in the improvement of the rural school, teaching in general, school buildings and grounds, teacher qualifications, the popularizing of institutes, educational councils and rallies, the flying of the United States flag above schools, and the introduction of current events into the curriculum. In addition, he increased the effectiveness of Michigan's compulsory school law, championed the cause of free textbooks, supported the consolidation of schools, and wanted to raise teaching to the same professional level as law and medicine.

As an orator, Pattengill made his imprint upon the people of Michigan because he spoke in a language understandable to all. Education and patriotism were the two general themes of his speeches because he believed them to be essential for the individual and for the country.

Pattengill's contributions to education in Michigan were in the practical rather than in the theoretical realm. He took other individuals' ideas and put them into effect. Because of his activities as an educational journalist and as Superintendent of Public Instruction he was an educational leader in Michigan and as such exerted a lasting influence.

Microfilm copy of complete manuscript of 452 pages, \$5.65. Enlargements 6" x 8", 10¢ per page.

THE CONTRIBUTIONS OF JOSEPH LEE TO THE MODERN RECREATION MOVEMENT AND RELATED SOCIAL MOVEMENTS IN THE UNITED STATES

(Publication No. 3590)

Allen Victor Heimbach Sapora, Ph.D.
University of Michigan, 1952

The purpose of this study is the investigation of the life of Joseph Lee, with particular reference to his influence upon the growth of the modern recreation movement and related social movements in the United States since 1880. The analysis of the work and contributions of Joseph Lee, an outstanding

leader in the recreation movement, shows the fundamental aspects of the growth and development of the entire field of recreation and its relation to other social movements.

The procedure in the study was to make a comprehensive analysis of voluminous data regarding Mr. Lee. This included books, magazine articles, personal letters, memoranda, and correspondence, as well as proceedings, records, minutes, reports, and other unpublished data regarding his work as found in the records of the groups and agencies with which he worked. Interviews were held with several persons in Mr. Lee's immediate family and with many of his contemporaries, co-workers, and colleagues.

The study reveals that Joseph Lee, son of a wealthy Boston banker and member of the early Bostonian aristocracy, spent most of his life as a philanthropic social worker. He was involved throughout his lifetime with the problems of immigration and legislation related to it. His influence was extremely significant in obtaining legislation regarding juvenile courts, prison reform, housing, health and sanitation, and the correction of many other social ills. He also worked throughout his lifetime to improve our educational system.

Although he worked in these many fields, Lee's contributions in the field of recreation surpass his many other achievements and may be summarized as follows:

1. Joseph Lee consistently maintained that recreation was allied with education; and that education was most important in the perpetuation of our democratic way of life. He pioneered many educational developments in the Boston schools through his work in the kindergarten movement, the vacation schools, school health and medical inspection, the manual training curriculum, and physical education activities.

2. Lee, in his book *Play in Education*, gave to the recreation movement a philosophy of play. His basic philosophy of play — for both adults and children — is in large measure embodied in the guidance of school, community, and agency programs of recreation today.

3. Lee was also a pioneer in developing procedures for the practical administration and operation of playgrounds and community centers, as demonstrated by his frontline work with his Boston "model" playground between 1900 and 1907.

4. Lee exerted a significant influence in the development of standards in the recreation field: standards for equipment, facilities, areas, and the training of recreation leaders.

5. Lee exerted a marked influence throughout his career in the development of public recreation as a basic governmental, tax supported community service.

6. And finally, it is reasonable to conclude that through Lee, a key member of a great team of leaders in the National Recreation Association, the recreation profession has reached its present status. Certainly, if anyone deserves the title, Joseph Lee may be called the founder of the national play movement, the forerunner of the modern recreation movement in the United States.

Microfilm copy of complete manuscript of 459 pages, \$5.74. Enlargements 6" x 8", 10¢ per page.

THE MOTOR ABILITY OF THIRD, FOURTH, AND FIFTH GRADE BOYS IN THE ELEMENTARY SCHOOL

(Publication No. 3558)

Albin Paul Warner, Ph. D.
University of Michigan, 1952

The purpose of this study is to investigate the motor ability of elementary school boys in physical education activities from the third through the fifth grades. The fundamental problems are to determine:

1. The average motor ability of elementary school boys from the third through the fifth grade levels.
2. The average gain in motor development for each year of growth.
3. The reliability of the motor ability test items at each grade level.
4. Norms for the test items at the third to the fifth grade level.
5. The relationship between motor ability and other measures of growth.

The test battery consisted of 28 items which were administered to a total of 941 boys. Of these, 346 were in the third grade, 297 in the fourth grade, and 298 in the fifth grade. The items included the following: Catching — Volleyball, Throw for Distance — Volleyball, Throw for Accuracy — Volleyball, Bouncing — Volleyball, Kick for Distance — Soccer Ball, Run — 30 Yards, Forward Roll, Jumping Rope, Standing Broad Jump, Shuttle Run, Leap Frog, Pull-up, Jumping, Balance, Swinging, Dodge Run, Push-up, Sit-up, Volley Against Wall — Volleyball, Base Running, Running High Jump, Catching — Tennis Ball, Throw for Distance — 12" Softball, Throw for Accuracy — 12" Softball, Bouncing — Tennis Ball, Volley Against Wall — Tennis Ball, Batting — 16" Softball, and Batting — 12" Softball.

Of the 28 test items, Leap Frog, Swinging, Running High Jump, and Batting — 16" Softball were eliminated early in the testing for administrative convenience. Items of Catching — Volleyball, Bouncing — Volleyball, Forward Roll, Jumping Rope, Pull-ups, Balance, Push-ups, Catching — Tennis Ball, and Batting — 12" Softball were treated as percentages and expressed in tables. The following items: Throw for Distance — Volleyball, Throw for Accuracy — Volleyball, Kick for Distance — Soccer Ball, Run 30 Yards, Standing Broad Jump, Shuttle Run, Jumping, Dodge Run, Sit-ups, Volley Against Wall — Volleyball, Base Running, Throw for Distance — 12" Softball, Throw for Accuracy — 12" Softball, and Volley Against Wall — Tennis Ball had distributions with sufficient spread of scores and were treated statistically for means, standard deviations, standard error of means, difference between means,

standard error of the differences and significant difference between means. Percentile tables for these items were established for the third, fourth, and fifth grades. Means were expressed graphically with superimposed standard deviations.

The items with the highest reliabilities were: Throw for Distance - 12" Softball, Standing Broad Jump, Kick for Distance - Soccer Ball, Throw for Distance - Volleyball, Run 30 Yards, Volley Against Wall - Tennis Ball, and Jumping.

Five general conclusions can be drawn from this study.

1. The items tested show an increase in motor performance with increase in grade level.
2. The average gain in motor ability for each test item is significant between all grade levels with the exception of Sit-ups.
3. There is overlapping in performance on each item at all grade levels.
4. The relationship of weight, height, and age to the various items of motor ability was low.
5. There are tests at each of the three grade levels which have reliability coefficients above .80.

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4) Analysis of variation in more than one dimension, 5) Linear discriminant functions, 6) Cross-validation, and 7) Test of equivalence of the two samples. One sample was used for the main statistical analysis and the other sample was used for cross-validation purposes.

Significant D_2 values were obtained between all combinations of pairs of groups except pre-business and pre-law. The results of the analysis of variation in more than one dimension indicated that the five groups could be represented in two dimensions. Each dimension being a linear compound of the four measures.

The linear discriminant functions when applied to a new sample classified students significantly better than chance. Pre-business students were not classified better than chance and unsuccessful students were classified somewhat more accurately than the other groups of students.

Using the D_2 -statistic, the two samples were found not to differ significantly with respect to the four measures.

Some of the literature related to prognosis in college and discriminatory analysis was considered. A separate chapter was devoted to description of statistical concepts and tools used in the study.

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EDUCATION AND PSYCHOLOGY

MULTIVARIATE STATISTICAL ANALYSIS OF DIFFERENCES BETWEEN SELECTED GROUPS OF COLLEGE STUDENTS

(Publication No. 3645)

Clifford Manley Christensen, Ph. D.
University of Minnesota, 1952

Two samples of students in the College of Science, Literature and Art at the University of Minnesota following pre-professional programs of pre-business, pre-law, pre-medical, and healing-arts were selected.

One sample was selected from students who entered the college during the fall quarter of 1949, and one from students who entered the college in 1950. Each sample was divided into five groups consisting of four groups of students maintaining a C average in the pre-professional programs mentioned above and one group of students maintaining less than a C average.

Four measures were obtained on each individual. These measures were as follows: 1) American Council on Education Psychological Examination, 2) Ohio State Psychological Test, 3) Cooperative English Test, and 4) High school percentile rank.

The differences between the five groups with respect to the four measures were analyzed by means of multivariate statistical tools. The analysis consisted of the following: 1) Tests of assumptions, 2) Over-all test of significance between the groups, 3) D_2 values and tests of significance of D_2 values,

COMPULSORY MILITARY TRAINING IN COLLEGE AND SUBSEQUENT SUCCESS IN THE ARMED FORCES DURING WORLD WAR II¹

(Publication No. 3662)

Stanley Evers Jacobs, Ph. D.
University of Minnesota, 1952

This study purports to evaluate the effects of a compulsory as against a voluntary ROTC program upon subsequent success of college graduates in their World War II military careers.

Data were gathered by means of a mail questionnaire survey with two followups of male graduates of the classes of 1939 at Ohio State University (a land-grant university with compulsory ROTC) and at the University of Minnesota (a land-grant university with voluntary ROTC). The high percentage of returns (89 per cent for Ohio State and an estimated 83 per cent for Minnesota), an analysis of early versus late returns, and the comparison of sample with historical data provide evidence of high validity.

Important findings based upon a selected sample of 1491 respondents are as follows: The findings of this study may not be generalized to the ROTC training as it exists today. The ROTC curriculum has been substantially revised as a result of World War II experience and is now considered to be a truly collegiate level course.

1. The percentages of respondents with Basic ROTC were 73 for Ohio State and 11 for Minnesota. The corresponding percentages of respondents with

Advanced ROTC were 14 (Ohio State) and 6 Minnesota; almost all of these procured reserve commissions. These percentages agree fairly well with historical data procured from the Department of the Army.

2. The date of entry into the service and duration of service were the same for the No-ROTC and Basic-ROTC groups from both universities. The Advanced-ROTC respondents entered the service earlier and served longer.

3. A greater percentage of Ohio State (77 per cent) than Minnesota (62 per cent) respondents, who served in the Armed Forces, served in the Army. While practically all Advanced-ROTC respondents served in the Army, there were proportionately more respondents from both universities with Basic ROTC who served in the Navy than those with no ROTC training.

4. Advanced-ROTC respondents practically all entered the service in the grade of 2nd Lieutenant. The modal grade of entry for the No-ROTC and the Basic-ROTC groups from both universities was Private, and there were no significant differences between the groups.

5. The modal grade upon completion of service was Major for the Advanced-ROTC respondents and was Captain (Army) for both the No-ROTC and the Basic-ROTC groups from both universities, there being no significant difference between the latter two groups.

6. Sixty-eight per cent of respondents from each university achieved a commissioned status. There were significant differences between services in this respect, approximately 79 per cent of Naval personnel having achieved commissions.

7. For those who entered the service in the grade of Private (or Apprentice Seaman) there was no significant difference in the highest grade achieved between the No-ROTC and the Basic-ROTC groups from both universities.

8. In rating the value of ROTC training to their military careers the Advanced-ROTC respondents from both university rated the training to be of greater value than did Basic-ROTC respondents. However, there were no inter-university differences between like groups.

The following general conclusions were drawn. The Basic ROTC course in itself, whether compulsory or voluntary, was of no demonstrable value to the individual in terms of success in his World War II military career. The Basic plus the Advanced ROTC Courses were of considerable value to the individual in terms of success during his military career and were of value to the nation, since reserve officers entered the service earlier, served longer, and served in higher grades. A compulsory program was of greater value to the nation than a voluntary program, because it produced more reserve officers.

1. This study was performed as a Ph. D. thesis at the University of Minnesota. The opinions expressed in this thesis are those of the writer and are not necessarily the official views of the Department of the Army.

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A STUDY OF GROUP DISCUSSIONS AMONG INDIAN STUDENTS ON A CONTROVERSIAL SUBJECT

(Publication No. 3586)

Blaise Levai, Ed. D.
University of Michigan, 1952

This is a study of group discussions and their effects on individual attitudes. The study seeks to investigate changes of attitudes as effected by small groups involving individuals from varied cultural backgrounds, and to explore some aspects concerning interpersonal communication among persons holding conflicting views.

The experiment involved one hundred-twenty graduate students from India and Pakistan who were secured at the following universities: Michigan, Columbia, Chicago and Wayne. The participants were divided into ten groups: Baniyas, Brahmins, Muslims, Sudras, Jains, Sikhs, Parsees, Vaisyas, Kshatriyas and Christians. These groups were placed into three broad categories — high, middle and low classes — to determine whether social status had any significant bearing on behavioral interaction.

There were twenty group discussions made up of six members each who participated in a half-hour discussion on the controversial subject: "The Future of India and Pakistan: United or Divided?" To provide later analysis of results these discussions were recorded on a Brush Tape Recording machine and then transcribed. Each member was presented with a questionnaire concerning his attitude on the subject before and after participating in the discussion. The questionnaires were classified to determine whether there was a change in attitude following group discussion.

The interactions of the subjects during the group discussions were analyzed by the sequential content method devised by Robert F. Bales. In these forms each response was coded into four major behavioral categories: A. Cohesiveness, B. Opinions, C. Questions and D. Antagonism.

Upon the basis of these two hundred-forty questionnaires and the interaction analyses of the behavioral content of twenty group discussions, the following conclusions seem warranted:

1. Changes in attitude following group discussion were in a positive direction rather than negative, i. e., toward unification of India and Pakistan rather than permanent bifurcation.

2. There was a tendency toward a higher degree of attitude change in the lower class groups than the middle or higher class groups.

3. There were more opinions and attempted answers presented toward the end of a discussion than at the beginning.

4. There were more questions asked in the beginning of a discussion than at the end.

5. There was a relatively high percentage of total verbal participations by high-status members of the group.

6. Middle-class groups and low-class Christian groups expressed a higher level of cohesiveness than the higher-class groups.

7. High-status members in the group gave a relatively high proportion of the opinions.

8. High-status members and low-status Christians gave more antagonistic responses than the middle-status group.

9. Caste hierarchy was reflected in roles assumed in the group discussions. In the majority of cases the high-status members began the discussion and assumed the leadership role.

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VOCATIONAL INTERESTS OF AGRICULTURAL EXTENSION WORKERS AS RELATED TO SELECTED ASPECTS OF WORK ADJUSTMENT

(Publication No. 3570)

Rowland Ray Pierson, Ph.D.
Michigan State College, 1951

The purpose of this study was to provide a description of the vocational interests of County Agents and 4 H Club Agents in Michigan and to determine the Strong Vocational Interest Blank Scales that might be useful guides in the selection of more effective and more satisfied Agents. The subjects studied were the 81 County Agents and 48 4 H Club Agents who were in the Michigan Extension Service in September, 1950, and were still employed in May, 1951.

The interests of the County Agents and 4 H Club Agents are somewhat similar. In comparison with Strong's criterion groups, the Agents have relatively high scores in "technical" occupations, especially farming and vocational agriculture teaching, and in "social welfare" occupations such as YMCA physical director, public administrator, and social science high school teacher. In general, their interests are lower than those of college seniors in business occupations, although a minority indicated fairly high interests in this area. Their interests are low in the mathematical and physical science areas and in the occupations of certified public accountant, musician, artist, psychologist and architect.

Variable work effectiveness groups of Agents were established on the basis of a forced ranking rating by a panel of seven judges, and variable job satisfaction groups were established in terms of their scaled or raw scores on an adaptation and extension of the Hop-pock Job Satisfaction Blank.

In comparison with the "less effective" County Agents the "more effective" had higher mean scores with significant intensity of relationship to work effectiveness on the Personnel Director, and Social Science High School Teacher scales and similarly significant lower scores on the Farmer and Carpenter scales. The "more satisfied" County Agents had significantly higher scores than the "less satisfied" on the Teaching Satisfaction scale. By use of high and low cutting scores on these scales it was possible to select with significant accuracy answer sheets of County Agents predicted to be "less effective" and predicted to be "dissatisfied."

No scales were found which satisfactorily differ-

entiated "more" and "less" effective 4 H Club Agents. In comparison with the "less satisfied" 4 H Club Agents, the "more satisfied" Agents had higher mean scores with significant intensity of relationship to job satisfaction on the Policeman, Teacher, and Minister scales. These same Agents had similarly lower scores on the Architect, and Occupational Level scales. By use of high and low cutting scores on any five of these six scales it was possible to predict with significant accuracy "dissatisfied" 4 H Club Agents.

The Agents studied are a rather selected group in that the majority are considered to be satisfactory workers and that no individuals were included who had left the Extension Service for unsatisfactory work performance. Since variable work adjustment groups of the present Agents could be differentiated by means of these scales, it appears that they have satisfactory preliminary validity for selection purposes. However, the final test of their validity must rest upon cross-validation with new groups of Agents.

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ENGINEERING, CHEMICAL

RESIDUAL EQUILIBRIUM SATURATION OF POROUS MEDIA

(Publication No. 3581)

Henry Stephen Dumbrowski, Ph.D.
University of Michigan, 1952

The residual equilibrium saturation of porous media is defined as the volume percent of the pore space in the medium filled with liquid under conditions for which the flow rate of the liquid is zero.

The residual saturation of unconsolidated porous media consisting of a wide range of particle sizes and shapes using a number of liquids of different viscosities, densities, and surface tensions is investigated. The desaturation driving forces employed in these studies are gravity, centrifugal force, and the pressure gradient of air as a displacing fluid.

The problem is broken down into five separate "cases" illustrating the various liquid distribution systems encountered in porous beds:

Case I. Thick beds free of all end effects.

Case II. Thick beds with static end effects.

Case III. Centrifuge beds with static end effects.

Case IV. Thick beds with static and dynamic end effects.

Case V. Thin beds with static and dynamic end effects.

The terms "thick" and "thin" beds in this classification refer to the relative magnitudes of the bed thickness to the static drain height of the medium. The static drain height is the height to which liquid is retained in the bed by capillary action under the influence of gravity and centrifugal force. Static end effects imply no pressure gradient of a displacing fluid in the medium. Dynamic end effects result

from an imposed pressure gradient of a displacing fluid such as air.

Material balance expressions for calculating the average saturations of the beds represented by Cases I through IV have been developed in terms of the total bed thickness, L , and the following quantities:

1. S_0 = the saturation of the portion of the bed which is free of end effects.
 2. L_d = the static drain height thickness of the bed.
 3. L_e = the dynamic end effect thickness of the bed.
- S_0 is correlated in terms of a dimensionless capillary number, $\left(\frac{K}{g}\right) \left(\frac{\rho + \rho_a + \Delta P/L}{\gamma \cos \theta}\right)$

and includes the effects of bed permeability, liquid density, surface tension and contact angle, centrifugal force and pressure gradient. L_d is correlated in terms of a "drain number," $\left(\frac{K}{g}\right)^{\frac{1}{2}} \left(\frac{\rho + \rho_a}{\gamma \cos \theta}\right)$ which has

the dimensions of 1/ft. The dynamic end effect thickness, L_e , is correlated in terms of L_d and the static to dynamic driving force ratio, $(\rho/\rho - \Delta P/L)$.

A graphical correlation is presented for Case V in which the average saturation of the bed is plotted against a permeability - driving force product,

$$\left(\frac{K}{g}\right)^{\frac{1}{3}} \left(\frac{\rho + \Delta P/L}{\rho_2^{\frac{2}{3}}}\right)^2$$

having the dimensions of ft. The plot includes parameters of the bed thickness to static drain height ratio, L/L_d .

Example calculations illustrating the application of this work to engineering problems are included.

A radiographic X-ray method of analyzing liquid saturation distributions in porous media is presented as a part of the experimental work in this investigation.

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CONTINUOUS STIRRED TANK REACTORS; MASS TRANSFER RATES IN LIQUID-LIQUID SYSTEMS

(Publication No. 3435)

Rowland Frank Hein, Ph.D.
University of Minnesota, 1952

Undertaken as a preliminary to the study of heterogeneous reaction processes, this work is a study of mass transfer rates for liquid-liquid systems using a continuous stirred tank reactor. The systems studied were benzene-aniline-water and carbon tetrachloride-aniline-water. In each case aniline was transferred from the organic phase to the water phase. The feed streams were the organic solution and pure water. The vessel was a baffled glass cylinder of 408 ml capacity. A four-bladed, flat paddle was used.

The overall volumetric mass transfer coefficient, K_a , is given by the equation

$$K_a = \frac{F_w C_w}{V (C^* - C_w)}$$

where C_w is the concentration of the phase upon which K_a is based, C^* is the interfacial concentration

of this phase which is assumed to be at equilibrium with the bulk of the other phase, V is the volume of the vessel, and F_w is the flow rate of the phase considered.

Below about 300 RPM the benzene runs did not show good mixing. The impeller broke up the entering stream and the drops gently floated to the surface. At higher speeds in the benzene runs and for all of the carbon tetrachloride runs excellent mixing was observed. The change in operation represents the transition to turbulent mixing. The transition is a function of both the Reynolds and the Weber numbers.

For this turbulent range, dimensional analysis suggests that the data be correlated by an equation of the form

$$K_a \frac{V}{F_o} = C \left(\frac{d^2 N \rho}{\mu}\right)^m \left(\frac{d^3 N^2}{\omega}\right)^n$$

where F_o is the flow rate of the other phase, d is the diameter of the impeller, N is the agitator speed, ρ and μ are the density and viscosity of the phase upon which K_a is based, and ω is the kinematic interfacial tension obtained by dividing the interfacial tension by the density difference of the two phases. c , m , and n are constants. This form neglects the Schmidt group which was not varied in the work.

The data obtained over a 10-fold range of Reynolds number and a 100-fold range of Weber number gives as values of the constants

$$\begin{aligned} c &= 8 \times 10^{-5} \\ m &= 1 \\ n &= 1.15 \end{aligned}$$

Since it is impossible to distinguish between the mass transfer rates for the controlling film located inside or outside of the drops, it is believed that agitation within the drops is of the same degree as in the continuous phase.

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SYNTHETIC CATION-EXCHANGE RESIN AS AN ACID CATALYST IN CONTINUOUS LIQUID PHASE ESTERIFICATION

(Publication No. 3549)

David Israel Saletan, Ph.D.
University of Michigan, 1951

This is a study of the behavior of ion-exchange resin of the nuclear sulfonic acid type as a catalyst in the synthesis of ethyl acetate from ethanol and acetic acid. The effect of temperature, resin particle size, and reactant concentrations upon rate of esterification has been determined.

The spherical beads of resin were packed as a fixed bed in a tubular glass reactor. A liquid feed, a mixture of ethanol, acetic acid, and water, flowed continuously through this resin bed. Compositions of feed and effluent liquid were determined at steady-state, for a wide variety of operating conditions. By "steady-state" is meant a condition of dynamic equilibrium, where the composition at

a point in the bed no longer varies with time. Reaction temperature was varied from 30° to 70° C. Residence time of the feed in the bed ranged from 0.025 to 0.40 hours. The resin bead size varied between 16 and 100 Tyler mesh.

Mass transfer in the liquid phase is a negligible factor in determining overall esterification rate. Reaction rates have been correlated as a function of composition by a consecutive reaction mechanism which leads to a modified second-order rate expression. The resin beads have been treated as a disperse phase, a solid solution of the reactants and products of the esterification reaction. Overall rate of esterification depends primarily upon the reaction rate at the surface of the resin phase and upon the diffusional characteristics of the components in the resin phase.

Results were correlated by the differential rate expression:

$$F \cdot d [\text{EtOAc}] = \frac{k_2 \phi}{480} \cdot \frac{K [\text{EtOH}]}{1.0} \frac{[\text{HOAc}] - [\text{EtOAc}] [\text{H}_2\text{O}]}{[\text{EtOH}] + [\text{H}_2\text{O}]} dW$$

where the bracketed terms are concentrations in moles/liter

F is the feed rate, moles/hr.

W is the weight of resin in grams.

K is the esterification equilibrium constant

k_2 is the specific reaction velocity constant in the resin, related to temperature by:

$$\ln k_2 = 23.038 - \frac{7203}{T}$$

k_2 in liters/mole hr. T in °K.

ϕ is a volumetric efficiency function for the resin catalyst. It provides a measure of the effect of diffusion within the sphere: when diffusional resistance is high, the efficiency approaches zero; when diffusional resistance is low, the efficiency approaches unity. ϕ is an analytical function of resin bead size, the specific reaction velocity constant, and the diffusivities of reactants and products in the resin.

The specific reaction velocity constant for the resin-catalyzed esterification is 1.8 times the constant for the homogeneous reaction catalyzed by hydrochloric acid.

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ENGINEERING, CIVIL

ANALYSIS OF CONTINUOUS SHELLS BY THE METHOD OF SUCCESSIVE APPROXIMATIONS

(Publication No. 3587)

Gunhard Oravas, Ph. D.
University of Michigan, 1952

In this study the method of successive approximations is proposed for the analysis of continuity between shells of constant thickness. This work is divided into three main sections.

The first part treats the spherical shell by asymptotic approximation and using these results all the necessary factors are derived for the use of moment distribution method. The limitation of the usefulness of the asymptotic approximation is discussed and for shallow shells the solution is given by Bessel's functions. The individual loading cases are solved by superposition of the boundary value problem with the membrane solution.

The cylindrical shell is solved by the exact method in the second part and various factors derived for the use of the successive approximations procedure. For long cylinders approximate solutions are worked out, permitting separate analysis for both ends of the shell.

The third part deals with the theory of conical shells. The exact solution is derived by Bessel's functions but for practical applications the terms

with lower potential in the variable are neglected as compared with the higher ones.

The hoop girder and circular plate are also analysed by the proposed method. For all three shells graphs are presented for the stiffness, the change of reaction due to the change of moment, fixed-end moments and reactions for various loadings and edge translation. The carry-over factor for the cylindrical shell is also graphed.

Applying the method to the problem of continuous shells the joints are first kept from translating, while moments are distributed and joint reactions found to keep the structure in equilibrium. Then each of the joints are given a fixed radial translation, one at a time, while the other joints are kept from moving. The moments are then balanced. In each case joint reactions are calculated to provide a balanced system of forces. The final forces are obtained by superposition of all the individual displacement solutions in proper proportion to satisfy the exterior reactions.

Examples illustrate the application of the proposed method. This procedure of analysis can be extended to apply to compound shells and cylindrical shells with stepwise or linearly varying thickness and/or partial loading by introducing artificial restraints and then removing them if necessary by radial displacement. Standpipes with intermediate stiffening rings can also be analysed by this method. The proposed procedure reduces the number of simultaneous equations in the conventional method of analysis and neither the increasing complexity of the structure nor of the loading offers any additional difficulties.

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ENGINEERING, ELECTRICAL

NATURAL LIMITATIONS ON THE MAXIMUM FREQUENCY OF COHERENT OSCILLATIONS

(Publication No. 3595)

Robert Stratman Elliott, Ph.D.
University of Illinois, 1952

Coherent oscillators are divided into two groups. Group I contains all oscillators which employ a resonant structure to extract energy from a shaped electron beam, the useful output being obtained by coupling to the field of the resonant structure. Group II contains all coherent oscillators which do not fit the description of Group I. The inequality $\mathcal{Q}_0^2 > \frac{2\omega^2\epsilon}{Q_0^2 V} U_{AV}$ must be satisfied by any Group I oscillator if it is to function. \mathcal{Q}_0 is the maximum a.c. beam current density, ω the angular frequency of oscillation, ϵ the permittivity of the medium surrounding the resonant structure, Q_0 the unloaded quality factor of the resonant structure, V the volume of the region of interaction of the beam and the resonant field, and U_{AV} the energy stored in the resonant field.

In scaling down any Group I oscillator, $Q_0 \sim \lambda_0^{1/2}$ and $V \sim \lambda_0^3$ where λ_0 is the free-space wavelength. Thus $\mathcal{Q}_0^2 > K V^6 U_{AV}$ is the criterion for oscillation. K is a constant which depends on the medium, the geometry of the resonant structure, the method of excitation, etc. An upper bound on the frequency is thus defined by $\nu_{\max} = \sqrt[6]{\frac{\mathcal{Q}_0^2}{K U_{AV}}}$. Since only $\sqrt[6]{K}$ affects the bound, different geometries yield substantially the same result. U_{AV} has a minimum value governed by the need to have the signal override the noise. For reasonable values of the parameters, the maximum frequency attainable with Group I oscillators is below the range of visible sight.

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DYNAMIC FREQUENCY CHARACTERISTICS OF THE MAGNETRON SPACE CHARGE; FREQUENCY PUSHING AND VOLTAGE TUNING

(Publication No. 3562)

Homer William Welch, Jr., Ph.D.
University of Michigan, 1952

Frequency pushing and voltage tuning, two fundamentally different frequency characteristics of magnetrons, are defined. An approximate picture of the space-charge behavior is presented with the purpose of acquainting the reader with the broad aspects of the problem before attention is given to details. Other work related to the present treatment is reviewed.

The magnetron is compared to other travelling-wave electronic devices. The basic assumptions and

the differential equations describing the motion of the electron are stated. The anode potential required to bring an electron into synchronism with the travelling wave is derived. A threshold energy which is the minimum potential energy which must be given up by the electron to reach the anode is defined. A drift velocity condition is defined by analysis of the direction of drift motion of the electron in the crossed r-f electric field and d-c magnetic field. This condition combines with the threshold energy conditions to focus the electrons into bunches or spokes maintaining a particular phase angle relative to the travelling r-f potential wave. A phase-focusing diagram which allows interpretation of magnetron behavior by graphical construction is described. The space-charge density in the spokes is estimated. The effect of limitation of the availability of d-c current is discussed and shown to be a condition favorable to voltage tuning.

The theory of induced current is reviewed briefly. This theory is applied to the magnetron using the picture of space-charge configuration developed in Chapter 2. Phase and admittance characteristics of equivalent circuits typical of magnetrons are analyzed. The results of this analysis are combined with the induced-current calculation and the theory of the space charge to compute the power generated and the operating anode potential as a function of frequency of oscillation. Curves illustrating the predicted form of frequency-pushing and voltage-tuning characteristics are plotted in dimensionless variables.

Measurements of the effect of the space charge on the resonance frequency of a 10-cm magnetron at various anode potentials and magnetic field in the preoscillatory range are presented. Performance characteristics of several types, with emphasis on frequency pushing and the effects of cathode emission, are presented and, in some cases, compared with the theory for four different magnetrons in the 13-cm to 17-cm range. Typical voltage-tuning characteristics are reproduced and interpreted.

The limitations inherent in the method of analysis which has been proposed are summarized. The most important points in the theory are reviewed. The practicability of the theory in its applications to design problems or analysis of experimental design is discussed. Topics for further study are suggested.

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ENGINEERING, METALLURGICAL

GRAIN REFINEMENT IN MAGNESIUM ALLOYS

(Publication No. 3417)

Keith Gordon Wickle, Ph.D.
University of Minnesota, 1952

Procedure
Small 14 lb. charges of magnesium alloys were

melted and poured into 1-inch diameter and 2-inch diameter sections using baked core-type molds. Initially a suitable test bar casting design was developed and used. However, finances did not allow expensive tensile tests so a simple economical cone casting was later employed. Grain size determinations were made by a modified intercept method which yielded greater accuracy than conventional methods.

Scope of Study

The following list summarizes the various points investigated by this work:

A. Study of Mg-Al alloys (0.00 - 10 per cent Al).

1. Effect of composition on grain size of superheated and carbon-inoculated Mg-Al alloys.
2. Effect of pouring temperature on grain size of superheated and carbon-inoculated Mg-Al alloys.
3. Effect of steel crucible on superheated and carbon-inoculated grain size.
4. Effect of time at temperature on superheated grain size.
5. Effect of stirring on superheated grain size.
6. Effect of atmosphere on superheated grain size.

B. Study of commercially pure magnesium and Mg-Mn alloys.

1. Effect of pouring temperature and iron pick-up on superheated grain size of pure magnesium and Mg-Mn alloy.
2. Effect of aluminum carbide additions on grain size of pure magnesium.

C. Effect of superheating on grain size of 1 per cent and 6 per cent Mg-Zn, Mg-Pb, and Mg-Sn alloys.

D. Comparison of grain size of Mg-Zr, -Ca, -Al alloys.

Results and Conclusions

Listed below is a summary of the results and conclusions of this work:

1. Commercially pure magnesium, Mg-Mn alloys, and Mg-Al alloys respond to grain refinement by superheating. Magnesium alloys, Mg-Pb, Mg-Zn, Mg-Sn, containing 6 per cent and less of alloy element do not respond to superheating.
2. Mg-Al alloys under 1 per cent Al respond but slightly, those containing 1 to 3 per cent Al respond markedly, and those above 3 per cent Al respond to a very great degree to superheating.
3. To obtain the fine grain size of superheating in Mg-Al alloys containing less than 3 per cent Al,

a high casting temperature must be used (1450° F-1650° F). Above 3 per cent Al the grain refining effects of superheating are retained for a short length of time at lower temperatures. It is thus not necessary in these alloys to pour above 1450° F.

4. Superheating Mg-Al alloys made from commercially pure magnesium is successful only when iron and manganese are present. These are either taken into solution to a greater degree at higher temperatures or develop an unstable intermetallic crystal form at high temperature which is compatible to nucleation in freezing magnesium.

5. The success of superheating low Mg-Al alloys is independent of the atmosphere above the crucible.

6. Carbon-inoculation methods are successful on all simple Mg-Al alloys including those containing small amounts of Al. No response is evident in commercially pure magnesium, Mg-Mg, Mg-Zn, Mg-Pb, Mg-Sn alloys.

7. Grain refinement in Mg-Al alloys by carbon-inoculation methods is a function of aluminum content and pouring temperature.

8. Aluminum carbide is not a practical inoculant for low Mg-Al alloys. Amounts of Al_4C_3 over 0.05 per cent may cause serious grain coarsening in a casting.

9. Success of carbon-inoculation appears to be independent of iron and manganese content and of crucible atmosphere.

10. On a per cent to per cent basis zirconium is a much more potent grain refiner than aluminum even though superheating or carbon-inoculation treatments are given the Mg-Al alloys.

Microfilm copy of complete manuscript of 80 pages, \$1.00. Enlargements 6" x 8", 10¢ per page.

ENGINEERING MECHANICS

A STUDY OF LAMINAR SWIRLING PIPE FLOW (Publication No. 3555)

Lawrence Talbot, Ph.D.
University of Michigan, 1952

The problem of the decay of a rotationally-symmetric steady swirl superimposed on Poiseuille flow in a round pipe was investigated theoretically and experimentally. The object was to determine the degree to which the rate of decay of the swirl as predicted by a linearized theory agreed with measured rates of decay at flow conditions near the critical conditions for swirl instability.

The solution to the linearized equation of motion for the swirl was obtained. Assuming solutions of the form $v = \phi(r)e^{-\beta z}$, where $\phi(r)$ gives the radial distribution of the swirl velocity, and β is a decay parameter, it was found that $\phi(r)$ was expressible

in terms of a confluent hypergeometric function. The decay rates for the first few swirl harmonics were determined; the approximate equations

$$\begin{aligned}\beta_1 &= \frac{22.2}{R} \\ \beta_2 &= \frac{77.0}{R} \\ \beta_3 &= \frac{103}{R}\end{aligned}$$

are valid for Reynold's numbers greater than 100. Axial and radial velocities induced by the swirl were calculated by the Polhausen integral approximation method.

Swirling flow was produced experimentally by rotating a section of the test pipe. Swirl velocities were determined from motion picture studies of colored oil droplets introduced in the flow. The stability of the swirl was investigated through visualization of a dye filament.

A critical curve for swirl instability was experimentally determined relating the angular velocity of the rotating section to the Reynold's number. Two types of instability were observed. In the low Reynold's number range the flow remained laminar after swirl breakup. For high Reynold's numbers instability resulted in turbulent flow, the transition from the laminar to the turbulent instability occurring at $R \approx 2300$. It was noticed that the turbulent instability was characterized by a periodic eddy structure in the initial stages of swirl breakup.

The theoretical and experimental values for the decay parameter were found to agree closely, even at conditions of flow near the critical conditions for instability. It was concluded that in the problem under consideration the non-linear effects are not appreciable for stable decay, but rather are associated with the transition to unstable flow.

Microfilm copy of complete manuscript of 92 pages, \$1.15. Enlargements 6" x 8", 10¢ per page.

FINE ARTS

THE SYMBOLIST CRITICISM OF PAINTING: FRANCE, 1880-1895

(Publication No. 3576)

Elisabeth Puckett Martin, Ph. D.
Bryn Mawr College, 1948

That modern art had its perceptive champions in 1890 as well as the twentieth century is proven by the French Symbolist criticism of the period. Symbolism was the literary banner of reaction to the Realist-Naturalist movement; its writers, in their critical function, were sympathetic towards

any expression in painting which likewise escaped the factual commonplace.

Symbolism began in the early eighteen-eighties with the vogue of Decadence, a glorification of rich, ripe cultures of the past, with a view toward repudiating the banality of contemporary materialism. Huysmans provided the best manifesto of Decadent taste in *A Rebours*, in which he admired Moreau's hermetic themes, and discovered Redon's haunting evocations of the dream world.

The new search for subtle allusion was fed by potent sources in literature, notably Baudelaire's delicate analysis of sensation and extra-sensory intuition, Mallarmé's oblique, suggestive use of words detached from ordinary utility, and Wagner's sensuous emotionalism blended of all the arts. The young Symbolist critics who superseded the Decadents, Verhaeren in Belgium, Wyzewa, Adam, Kahn and Laforgue in France, were strongly affected by these currents as they followed Huysman's lead in evaluating the exotic artists of the eighteen-eighties. Laforgue, under the impact of German philosophy, went furthest in exploring the sources of esthetic emotion, concluding that the artistic impulse was entirely amoral, sprung from the deep subconscious, so that it was the destiny of art to push this expression to its uttermost limits.

With the appearance of Seurat's rigidly-controlled Neo-impressionism, criticism took another turn. Fénéon rendered a precise analysis of Seurat's means, and the cleanness of the artist's crystallized, almost mathematical formula appealed to the growing demand for the expression of the essential ideal. Several critics labelled Seurat's work modern classicism.

This acceptance of stylized form, as well as the emphasis on the emotional and even irrational components of art, prepared the way, about 1890, for the understanding of Cézanne, Van Gogh and Gauguin. The Symbolist appraisal of the last two speaks particularly clearly of the close interaction between the visual and literary arts at this time.

Gauguin's own statements of the eighties show his awareness of Symbolism, as he discusses the painterly equivalents for human emotion. The broad concept of primitivism became in itself symbolic. His developed style of the eighteen-nineties naturally enlisted Symbolist defense, Aurier being the first thorough apologist. In several articles on Gauguin's "idealism", that writer discussed not only his obvious symbols, but his free creativeness, and the subjectivity which legitimately included distortion.

The idea of the artist as an isolated creative genius answerable only to himself, also dominated Aurier's parallel revelation of Van Gogh early in 1890. The critic called the latter a giant and hyper-esthete, justly described his style as forceful awkwardness, nervous violence, and a brilliant combination of intense color and brushwork. Van Gogh clearly incorporated the Decadent-Symbolist yearning for emotional extremes, as Gauguin fulfilled the need for Symbolist imagery.

Thus, regardless of their several limitations, the Symbolist critics of the new painting in France had

recognized and illuminated the nature of the radical changes taking place around 1890. The painter-critics Bernard and Denis expanded these concepts somewhat further, but essentially the way was already open to the flexible judgments necessary to the understanding of modern individualism in art.

Microfilm copy of complete manuscript of 236 pages, \$2.95. Enlargements 6" x 8", 10¢ per page.

FORESTRY AND CONSERVATION

THE ECOLOGY AND MANAGEMENT OF THE IDAHO RUFFED GROUSE (*BONASA UMBELLUS PHAIA*)

(Publication No. 3583)

Kenneth Eugene Hungerford, Ph.D.
University of Michigan, 1952

The Idaho ruffed grouse is found in most of northern Idaho, parts of eastern Washington and western Montana, and a section of southern British Columbia. Within the range in Idaho, six study areas were set up to investigate the life history and ecology of this game bird and to develop management practices.

The life cycle and food habits are generally similar to the eastern subspecies. Key winter foods consisted of the buds of broad-leaved shrubs, such as serviceberry and mountain maple. Detailed studies of the foods used on brood ranges were made, using a "food index" based on utilization and availability of each food by two-week periods during the brood season. Certain species, notably Kentucky bluegrass and Dutch white clover, were found to have a particularly high value during the late summer and early fall. Water availability was important for grouse broods during the summer. It was found that the entire daily water requirement of ruffed grouse in the summer could be furnished by dew moisture or by succulence moisture alone.

Habitat requirements were studied in relation to the vegetative type, topography and microclimate. Winter ranges, drumming territories, and nesting sites were located on the minor ridges or upper slopes. During the summer and early fall, the grouse broods occupied the ravines and lower slopes. A detailed study of microclimatic factors showed that temperature was best correlated with cover use. Winter and spring ranges were on the warmer sites with cover type being a minor factor. Grouse broods during the summer use the cooler locations during the heat of the day and the warmer sites for night roosting. The strong thermal inversions developing during a summer night are apparently more important than cover type in determining roosting sites.

The relations of grouse populations to parasites, disease, accidents, and predation were investigated. None of these influences was found to be a limiting factor. Cattle grazing can seriously deplete the cover and food used by broods during the late summer and early fall.

A census method for ruffed grouse in the northern Rocky Mountains was developed. It is an adaptation of the King method, designed to give reliable sampling of cover types in the mountainous areas of northern Idaho in a pre-hunting season population estimate. Results of the census for a five-year period are compared with other indices of grouse abundance.

The productivity of grouse populations on Idaho ranges, in the sense of a fall surplus, is shown to be higher than many of the best grouse ranges in the Lake States or the Northeast. The surplus was not harvested as shown by a hunting take of six to seven per cent of the fall population during the years 1948 through 1950.

Conclusions show generally that approved range and forest management practices are conducive to good grouse production on cut-over white pine lands. Minor changes in the application of these practices are recommended which will result in better grouse production.

Microfilm copy of complete manuscript of 229 pages, \$2.86. Enlargements 6" x 8", 10¢ per page.

GEOGRAPHY

THE MUSKEGON RIVER BASIN, MICHIGAN, A REGION OF CONTRASTS

(Publication No. 3585)

Roger Arnold Leestma, Ph.D.
University of Michigan, 1952

The purpose of this study is to describe in detail the area drained by the Muskegon River. The description is built around the exposition of the pattern of three important factors: the quality of the soil, the distribution of the present population, and the use of the land.

The analysis of the physical framework of the Muskegon River Basin shows separate patterns of surface features, vegetation, and soils with a certain degree of coincidence in these. In terms of human habitability the quality of soil seems to be of primary significance and, on the criterion number of farms per section, the Basin is separated into areas of poor, fair, and good soils.

It would be impossible to understand the present aspect of the Basin without knowledge of its history,

especially of the lumbering period, from which so many of the characteristics of settlement are derived. For this reason the section on present population distribution is preceded by a short but comprehensive account of lumbering.

The distribution of population is depicted by the actual plotting of individual residences on maps, and arranged into areas of sparse, moderate, and dense population by more or less arbitrary criteria based upon numbers of habitations within comparable areas.

In the Basin the principal uses of land are for agriculture, transportation, organized public uses, towns, petroleum extraction, and some is largely unused and remains as wild land. Each of these is described in detail setting forth both the nature and the distribution of the forms involved and the appearances of the land under the particular utilization. Detailed attention is given to the towns which are classified according to their function in the present economy of the Basin and the larger entity of which it is a part.

The conclusion is drawn that the landscapes which characterize the Basin are settling into a more or less stable condition following a sequent occupancy that included the exploitation of lumbering.

Microfilm copy of complete manuscript of 192 pages, \$2.40. Enlargements 6" x 8", 10¢ per page.

GEOLOGY

LATE MIDDLE CAMBRIAN TRILOBITE FAUNAS AND STRATIGRAPHY OF ALBERTA, MONTANA, WYOMING, AND UTAH

(Publication No. 2935)

Norman MacLaren Denson, Ph. D.
Princeton University, 1942

The Middle-Upper Cambrian boundary is now known, in the Cambrian sections of northern Utah, western Wyoming, and Montana, to lie either at or near the top of a shale series, either in the shale or in a partly equivalent limestone which transgresses the shale. That the upper part of this shale series is of about the same age in all these regions is indicated by the presence of two widely and readily recognizable trilobite faunules which are here defined as the *Brookscodia* (the younger) and the *Deissella* (the older) faunules. The 70 species of trilobites (60 of them new) represented in these faunules and in the next oldest *Thomsonaspis* fauna are described and figured. Twenty of the genera are new.

The discovery in the late Medial Cambrian beds of the north-central Cordilleran region of a number of trilobite genera previously known only from the North Atlantic region and eastern Asia shows that these

genera had wider geographic ranges than had previously been suspected.

Microfilm copy of complete manuscript of 195 pages, \$2.44. Enlargements 6" x 8", 10¢ per page.

GEOLOGY OF PINCHI LAKE, B. C.

(Publication No. 2953)

Arthur Charles Freeze, Ph. D.
Princeton University, 1942

Pinchi Lake is located in the north-central part of the Fort Fraser map-area (East Half), Coast District, British Columbia.

The stratified rocks in the vicinity of the lake belong to three lithologically and structurally distinct series: the pre-Upper Triassic series (probably Lower Permian), the Upper Triassic series (in part of Upper Triassic age) and the Cretaceous-Tertiary series (of possible Upper Cretaceous or Lower Tertiary age). Geologic relations indicate that each series is separated from the succeeding by a strong angular unconformity. The apparent conformable relations between the pre-Upper Triassic series and the Upper Triassic series is believed to have resulted from movement along the unconformity during a post-Late Triassic disturbance.

Detrital chromite and pebbles of chromite-bearing serpentine form the principal basis for correlating the rocks of the Upper Triassic series. These detrital products are present in a limestone bearing "*Pseudomonotis* subcircularis Gabb, and they are common in other beds of the Upper Triassic series, but they were not found in the pre-Upper Triassic series.

Glaucophane schists are confined to the pre-Upper Triassic series and they form part of an interstratified belt of dynamo-thermally metamorphosed magnesian limestones, cherty sediments and basic or intermediate flows, tuffs and minor intrusions. Ultramafic intrusions are associated with this belt of rocks. Paragenesis of glaucophane schists indicates that they were formed at relatively shallow depths and moderately low temperatures. Continually strong stress is not considered necessary for the formation of this mineral. An introduction of soda is believed to be essential to account for the distribution and amount of glaucophane present.

The ultramafic rocks in the Fort Fraser map-area are believed to have been intruded during the post-Late Palaeozoic — pre-Late Triassic interval rather than in Jurassic time. A review of the literature on the ultramafic rocks of British Columbia indicates that the ultramafics in the Fort Fraser map-area form part of a probable Late Palaeozoic serpentine belt that extends from north-central Alaska through the interior of British Columbia to the northern part of the State of Washington.

The cinnabar deposits are located along a north-westerly trending fracture zone in the pre-Upper Triassic complex. This fracture zone is believed to be a subsidiary structure to an inferred northwesterly trending rift fault a few hundred feet to the north. The rift fault appears to be in part controlled by the contact between the pre-Upper Triassic and Upper Triassic rocks.

The cinnabar deposits are typical of the epithermal class and cinnabar was one of the last minerals to form during an extended period of mineralization. The cinnabar mineralization and accompanying mineral suite are much younger (post-Late Triassic) than the glaucophane and related minerals.

Microfilm copy of complete manuscript of 168 pages, \$2.10. Enlargements 6" x 8", 10¢ per page.

GEOLOGY OF THE SHELL CANYON AREA, BIGHORN MOUNTAINS, WYOMING

(Publication No. 2969)

William Bayard Heroy, Jr., Ph. D.
Princeton University, 1941

Major structural units have been recognized and defined by previous workers in the Bighorn-Beartooth region. The Bighorn anticlinal uplift has been found to be divisible into four major asymmetric segments: a southern, a south-central, a north-central, and a northern. The northern segment is characterized by steepening to the east and west; the southern and north-central segments are characterized by steepening to the west; and the south-central segment is characterized by steepening to the east. These segments can be traced out roughly in the adjacent basins by means of minor asymmetric structures.

The boundary between the southern and south-central segments of the Bighorn Range is clearly defined by the transverse Tensleep Fault. The boundary between the north-central and south-central segments is not clearly defined, nor is the boundary between the northern and north-central segments. The adjustment between these segments has taken place in a different manner.

Evidence is presented to show that the adjustment between the north-central and south-central segments was accomplished progressively by means of minor units within the major segments. This adjustment took place along a zone of considerable width and not along a single fault-line.

The suggestion is offered that the monoclinical flexing along the mountain front, the high flat top of the range, and the regional structural patterns are indications that the dominant component in the deformation

was vertical, though the regional crustal shortening occurred as a result of horizontal compression.

Microfilm copy of complete manuscript of 107 pages, \$1.34. Enlargements 6" x 8", 10¢ per page.

CHROMITE DEPOSITS NEAR RED LODGE, MONTANA

(Publication No. 2983)

Harold Lloyd James, Ph. D.
Princeton University, 1945

The chromite deposits described in this report are in the southeastern part of the Beartooth Range, near Red Lodge, Montana. In 1941, 1942, and 1943, the U.S. Vanadium Corporation, the only producer in the district, shipped 21,958 tons of crude lump ore, averaging about 32 per cent chromic oxide (Cr_2O_3), and 11,689 tons of concentrates averaging about 40 per cent Cr_2O_3 . The ore was mined almost entirely by open-cut methods and carried by truck to the mill and railhead at Red Lodge.

In contrast with the stratiform deposits of the Stillwater area, 30 miles to the northwest, the chromite deposits of the Red Lodge district consist of lenses and pods scattered at random in sill-like masses of serpentine, which are intrusive into a metamorphosed series of ancient sedimentary and volcanic rocks. The pods range in size from those containing a few pounds of ore to those containing as much as 35,000 tons of rock that will average 20 per cent or more Cr_2O_3 . The metamorphic rocks, together with the serpentine, are now found as roof pendants in the gneissoid pre-Cambrian granite which underlies most of the Beartooth Range. Dikes of diabase, porphyry, and andesite cut the granite and older rock.

The Cr_2O_3 content of the cleaned chromite, separated mechanically from the silicate gangue, ranges from 35 to 53 per cent, with the Cr:Fe ratio varying from 0.66 to 2.1. The ore as mined rarely contains over 40 per cent Cr_2O_3 . Reserves of indicated ore with an average chromic oxide content of 20 per cent or more are estimated at about 19,000 long tons, and it is considered unlikely that this figure can be materially increased by surface prospecting. There are, however, several square miles of upland surface deeply mantled with disintegrated rock and morainal rubble, beneath which at least a few deposits must lie concealed. Geophysical prospecting by means of a magnetometer gives promise of being useful in finding this concealed ore, since the serpentine contains enough magnetite to yield higher magnetic values than most of the country rock, and exceptionally high values are obtained over known ore bodies.

A paved highway passes through the district within 5 miles of all the known deposits, and most of the deposits are now connected with the highway by secondary roads. The altitude of the deposits ranges from 8,000 to 11,000 feet, and winter operations are seriously hampered by the heavy snowfall.

Microfilm copy of complete manuscript of 139 pages, \$1.74. Enlargements 6" x 8", 10¢ per page.

PSEUDO-PYROMETASOMATIC GOLD AT HEDLEY, BRITISH COLUMBIA

(Publication No. 3019)

William Henry Patmore, Ph. D.
Princeton University, 1941

The five main purposes of this thesis are:

1. To suggest that, although the Hedley gold deposits have for many years been referred to by Lindgren as the type contact metamorphic gold ore, the gold is a late (probably epithermal) addition and is therefore pseudo-pyrometasomatic relative to the associated high temperature silicates. Lindgren's terms, pyrometasomatic, hypothermal, mesothermal and epithermal are used throughout this paper to designate temperature alone. The writer does not believe that extrinsic pressure is able to cause a phenomenal shift in the temperatures of deposition of most minerals. It is thought that the pressure does affect the textures.

2. To show that there is an extended temperature sequence which involves deposition of most minerals within their normal temperature ranges, thus refuting the long held idea that close association of silicates with sulphides, and the presence of mutual boundaries (lack of fracturing), signify either contemporaneous or closely-contemporaneous deposition (e. g. that zeolites and native bismuth, etc. are not necessarily formed at "hyperthermal" (pyrometasomatic) temperatures simply because they happen to occur in close conjunction with such minerals as andradite, merwinite, spurrite, and ferrosalite).

3. To propose that, if such an extended sequence is present to any appreciable degree (amount or importance), the deposits in question are incorrectly termed pyrometasomatic (or contact metamorphic-metasomatic). It is suggested that they might better be designated polymetasomatic where hyperthermal (pyrometasomatic) minerals begin the sequence and polythermal where the temperature facies involve only hypothermal to epithermal temperatures. Further differentiation would seem hazardous.

It is not intimated that certain minerals such as pyrite, magnetite, and quartz cannot be generated at more than one temperature range, but it is believed that these changes require special conditions (change in P_h , pressure, volume, etc.), and seldom, if ever, form a continuous series.

It is realized that most deposits will show some extension beyond the arbitrary temperature ranges (no reference to pressure) chosen by Lindgren, but it is suggested that the new terminology should only be applied to cases of distinctly abundant mineralization in all, or the widest separated of the various temperature ranges involved (epithermal, mesothermal, hypothermal, and hyperthermal), or where the mineralization is outstanding due to its value or scientific importance. As in any classification, border-line cases are bound to be controversial issues.

4. To suggest that conditions of extended deposition are common and to be expected. Such deposits are not to be confused with the types produced by abnormalities of environment which cause a high degree of telescoping of time and temperature (e. g. Bolivian tin deposits).

5. To attempt to show that the Hedley gold and most of the associated minerals, excepting the highest-temperature silicates, are products of a felsic and not of a mafic magma. Analogous problems of other camps are discussed.

The early portion of the thesis is a presentation of the problems involved, followed by a review of theories of previous investigators.

This is succeeded by a summary of data concerning the structure and development of so-called contact-metamorphic deposits. Definitions are dealt with where necessary.

Then the general structural relations of the Hedley area are considered, with special reference to the possible ore channels and sources.

A detailed study is presented of the Hedley Canty mine, one of the three similar gold producers of that area. Stress is given to paragenesis, source and nature of solutions, and the genesis of pyrometasomatic silicates.

Classification and abnormalities are discussed. Finally, comparisons are made with similar and analogous deposits, in order to show that they are common and are the result of normal deposition.

Microfilm copy of complete manuscript of 260 pages, \$3.25. Enlargements 6" x 8", 10¢ per page.

**CONTRIBUTIONS TO THE MINERALOGY
OF CHROMITE BASED ON THE CHROMITE
DEPOSIT OF CASPER MOUNTAIN, WYOMING**

(Publication No. 3046)

Hubert Kirk Stephenson, Ph. D.
Princeton University, 1941

In the Casper Mountain deposit, chromite occurs in a talcose schist which represents an ultramafic rock altered by a later felsic intrusive. The talcose schist and associated rocks are thought to occur as roof pendants in a quartz monzonite.

The chromite shows wide variation in physical properties and chemical composition, a variation which results from modification of the chromite by iron-bearing solutions. In seven analyzed samples selected to represent the range of magnetic variation, iron content is high and Cr_2O_3 content ranges from 13.7% to 44.7%. The principal changes in composition were brought about by the addition of Fe_2O_3 and FeO and by the removal of Al_2O_3 , Cr_2O_3 and MgO .

Microfilm copy of complete manuscript of 90 pages, \$1.13. Enlargements 6" x 8", 10¢ per page.

**THE PROTEROZOIC ROCKS OF THE SQUAW
LAKE-WOOLLETT LAKE AREA,
WEST CENTRAL LABRADOR**

(Publication No. 3064)

Duncan Richard Elmer Whitmore, Ph. D.
Princeton University, 1943

The Squaw Lake-Woollett Lake Area of west central Labrador is underlain by a folded and faulted sedimentary series of Proterozoic age. This series, the Kaniapiskau Group, is largely of shallow water deposition and includes shale, dolomite, quartzite, greywacke and iron formation. The dolomites appear to have been deposited as such, the work of solutions being confined to the addition of iron to the rock. The most important formation economically is the iron formation which is described in some detail. Although the iron formation is very similar to the Biwabik and Gunflint formations of the Lake Superior Region, it differs in containing no greenalite and little carbonate. The iron formation has undergone enrichment in iron,

once shortly after deposition and again at a later period. Enrichment has involved both the leaching of silica and the addition of iron. Bodies of hematite of ore grade have been produced. The area is near the Labrador centre of glaciation and glacial erosion appears to have been slight.

Microfilm copy of complete manuscript of 137 pages, \$1.71. Enlargements 6" x 8", 10¢ per page.

HISTORY

THE TUCKAHOE IN THE VALLEY

(Publication No. 2916)

Willard Francis Bliss, Ph. D.
Princeton University, 1946

The Shenandoah Valley of Virginia has long been regarded as the home of Germans and Scotch-Irish who swept down into the great limestone valley from Pennsylvania during the years following 1730. Scant attention has been given to the Virginians who moved into the Shenandoah from the Piedmont and Tidewater east of the Blue Ridge Mountains.

Prior to 1750 the large planters and land speculators of eastern Virginia had taken up several hundred thousand acres in the lower section of the Valley and since the third decade of the 18th century Millwood (Clarke County) has been the center of Tuckahoe life in the Valley.

The Shenandoah Valley was by far the most fertile section of Virginia and, in view of the decreasing fertility of the soil in eastern Virginia as a result of tobacco cultivation, the interest of the planters in that valley was exceptionally keen. Consequently they acquired vast tracts of land there even before the immediate need arose. As their eastern fields gradually yielded smaller crops of a poorer quality, portions of the valley tracts were brought under cultivation by the establishment of "quarters" thereon. By this means the planter could remain in the East while his overseer and a force of slaves from an older plantation or "quarter" brought within the scope of production the fresh land of the Valley. Not until the time of the Revolution did the large planter families — Carters, Burwells, Pages — of eastern Virginia forsake their family seats in the east for the western part of Virginia.

Long before the dwindling fortunes of the large planter forced him to leave the East, the small

planter and farmer, faced with the ruinous competition of negro slavery and the consequent expansion of tobacco production, had left the old fields of his eastern home for the fertile land of the Shenandoah. The fact that large tracts of land were held in the lower valley by Virginians was a strong influence in directing to that section the stream of migration from the east which occurred in the middle decades of the 18th century. Large planters were not averse to selling or renting portions of their valley estates, and their agents, men who supervised their tenants and overseers, acted as "contact men" in directing small farmers of the east to these Shenandoah tracts. Tenancy, which was wide-spread in the Piedmont, now spread into the lower Shenandoah as a result of the activities of planters and their agents. By 1750 there were three well-traveled roads leading from tidewater Virginia into the lower Shenandoah, which fact attests to the large number of settlers moving westward. These roadways also became routes of trade which tended to bring the Valley under the influence of eastern merchants.

Once in the Valley, the small farmer found himself completely isolated from navigable rivers running to the sea; the price of land carriage was beyond his means. Consequently he became more self-sufficient: he abandoned his former slipshod methods, no longer cultivated a staple crop and adopted the methods of farming followed by his thrifty German and Scotch-Irish neighbors. Because of his loss of contact with the east he tended to develop a way of life alien to eastern interests. In religion the small farmer forsook the formal ritual of the Established Church and embraced the rising evangelical sects, the Baptists and Methodists.

The large planter carried to the Valley all the characteristics of the plantation civilization of eastern Virginia: slavery, staple crop, the manor-plantation system, the architecture of the lowlands. His children were educated at home or in eastern schools along the familiar classical lines; he retained his love for the Established Church, and the lower Shenandoah became the valley stronghold of the Anglican Church. Because of his wealth the large planter was able to retain his contact with the east and that section thereby continued to exert a profound influence upon his life. Even in his case, however, changes were wrought: wheat gradually replaced tobacco in his fields, his complete hold on county affairs was broken by the presence of numerous Germans and Scotch-Irish, a spirit of tolerance was fostered by the mixture and inter-marriage of these various groups. The Shenandoah Valley of the 18th century was an important part of the American "melting pot."

Microfilm copy of complete manuscript of 285 pages, \$3.56. Enlargements 6" x 8", 10¢ per page.

LABOR AND POLITICS IN 1928

(Publication No. 3403)

Vaughn Davis Bornet, Ph. D.
Stanford University, 1951

This is a study of the alternative paths to political power available to organized labor in the presidential election of 1928. In choosing to follow their traditional "nonpartisan" or pressure policy, labor leaders rejected five other possibilities. The Communists of the United States tried to convince the union members that as "proletarians" they should accept Communist leadership and doctrines. They were rebuffed. The Socialist Party tried to get the "workers" to accept its leadership but failed. Three other possibilities were not given serious consideration in 1928: the formation of a labor party composed solely of union members, the creation of a national farmer-labor party by alliance with the farmers, and the theoretical possibility of complete political abstinence.

Two chapters present introductory economic and political background material, nine the course of union pressure politics in the election, five the Communist alternative, three the Socialist alternative, and two offer a summary and conclusions. A bibliography of fifty-six pages lists materials used in the research.

The labor views of Hoover, Smith, Roosevelt, Thomas, and Foster receive attention. The appeals to organized labor by their parties are discussed in detail. The political pressure methods of the New York State Federation of Labor are traced. A survey of the rise of the Communist Party of the United States was drawn largely from primary sources.

In 1928, despite membership losses since the World War, labor leaders considered that they were making progress. Their chief complaint was what they called the unwarranted issuance of injunctions in labor disputes. The mitigation of this was labor's chief legislative desire for 1928.

It had been determined at the A. F. of L. convention in 1927 that no independent party action would be taken in 1928. Before the party conventions the Federation preserved neutrality between leading presidential candidates, and its Executive Council endorsed no candidate at any time. Yet a majority of Council members personally supported Smith. The Federation tried to exert pressure on candidates for Congress by sending literature to state federations, city centrals, and member unions. It gave candidates no financial aid; few of the member unions did either. Numerous state federations, city centrals, union conventions, and important labor officials endorsed Smith.

Communist leaders stated officially that they campaigned as candidates to "mobilize" the working class, further class consciousness, abolish capitalism, get publicity for their cause, and bring about the eventual "overthrow" of the "present form" of society. Leaders declaimed that the workers could never vote their own "emancipation." American elections were termed "sham battles" and "trials of strength."

The goal of the Socialist Party was the creation of a socialist state. Its method was participation in democratic elections. Violence and revolution were rejected as means of attaining party ends. Socialist leaders had little hope of attaining office and power as candidates of their party alone. They hoped that propaganda, time, and circumstances might facilitate an alliance between themselves and the trade unionists so that a new party might win governmental control in a democratic election. This party would presumably contain wage earners, "workers of the mind," and working farmers. It would follow Socialist ideology and gain its organizational strength from the trade unions. Socialists sought extensive unionization as a matter of course. Their party attracted many non-Socialists because it supported a broad program of reform. As leaders increasingly tended to discuss immediate reforms, Socialists attracted persons who forgot, did not know, or did not care that the Socialists possessed a doctrinaire economic and political program.

The Communists clearly intended to circumvent orderly democratic processes. The Socialist intention to polarize the political parties by classes, moreover, might turn out to be as dangerous as the sectional division of the parties in the 1850's. The determination of union leaders to follow the traditional "nonpartisan" pressure policy in seeking their ends was a recognition of the varied party and personal interests within the labor group and a rejection of political alternatives whose immediate practicality was dubious and eventual results were unknown.

If the path organized labor chose was not completely effective as a means of realizing its desires in 1928, the labor group had done nothing to close the door to better results in other elections. Orderly change would still be possible. The two-party system in the United States could continue to serve as a fundamental instrument of the democratic way of life.

Microfilm copy of complete manuscript of 540 pages, \$6.75. Enlargements 6" x 8", 10¢ per page.

THE VIRGINIA MERCHANT

(Publication No. 2930)

Calvin Brewster Coulter, Jr., Ph. D.
Princeton University, 1944

The Virginia Merchant is a history of the Scots trader's contribution to the economic foundations of the "golden age" in Virginia. The eighteenth century was a very fruitful period. In Britain and the British colonies and probably in the countries of western Europe the mass of people devoted them-

selves to improving the material conditions of life within the existing economic and political institutions. They were generally successful everywhere. Commerce, especially British commerce, expanded widely. By the end of the century Great Britain was the greatest trading nation in the world.

The period, however, has appeared obscure and confusing to many investigators. English economic historians, for example, have been baffled by the fact that, while they know British trade expanded greatly over the century as a whole, economic pamphleteers always wrote about the decay of trade.

Fortunately, the tobacco trade of colonial Virginia offers a key that may serve to unlock many of the obscurities and confusions of eighteenth century commercial and economic development.

During the seventeenth century the enforcement of the Navigation Acts reduced Virginia to desperate straits. Thereafter a number of life giving innovations prepared the way for the mercantile expansion and prosperity. Virginia's tobacco gained permanent access to the world market. The Scots trader "invaded" the colony and by competing for tobacco with the English merchants they raised prices and by going out to the frontiers they opened up new markets. In 1730, a law in Virginia was enacted providing for the compulsory inspection and warehousing of tobacco. The merchants found it to be so beneficial to trade that they accommodated themselves to it.

The Scots congregated in northern Virginia and at the falls of the rivers, as well as in Norfolk. When tobacco culture expanded westward they extended their operations into the Piedmont. In time they built up a network of stores throughout back country Virginia. They were not alone in this, however, for English merchants and native Virginians followed after them. The Scots also did business in many parts of the Tidewater. But here the planter-merchant who consigned his hogsheads to England and who imported manufactured goods for himself and the yeomen farmers who were his neighbors always remained the dominant factor.

The goods that the Scottish merchants sold to the backcountry planters and farmers played an important role in the expansion of their trade. By and large their wares were "coarse" and also very inexpensive. In the days before the Act of Union between England and Scotland the merchants of the latter country had gone to ports like Whitehaven, hired ships, and bought English goods in order that they might trade within the Navigation Acts. Afterwards they continued their practice of going to Whitehaven and Liverpool in order to buy the best goods they could find at the lowest prices. Sometimes they even went to Bristol or London. Other Scotsmen moved to these ports where they settled as merchants. The merchants in England, with the exception of the Londoners who did not have to, copied Scottish trading methods. But the innovators never lost their lead in the "store" trade of Virginia.

The Scots traders handled a large proportion of Virginia's tobacco and their purchases formed an important element in Scottish commerce. Indeed, the mercantile interests of Glasgow, the chief port of the

country, centered upon tobacco and West Indian sugar. Because mercantile attention in both countries focused on the tobacco trade and on relatively little else, we can trace the working of mercantile economy more fully, especially in Virginia, than we can follow other branches of commerce in countries with diverse interests. For example, the tobacco trade in England is more obscure. We can see that the trade in Virginia moved in accordance with what we call the business cycle, a recurring series of depressions, revivals, prosperities, and crises. There was one cycle between 1736 or 7 and 1744, another one between 1745 and 1754, and a third between 1755 and 1764. These cycles resulted primarily from two causes: crop yields in Virginia and the requirements of the British market, and in particular the demands of the French, who purchased a great deal of the "ordinary" tobacco with which the Scots dealt, and also the availability of British credit. Good crops and good conditions in Europe made for prosperity in Virginia, bad crops and depression in Britain made for depression in Virginia. During the middle 1750's when both were very bad, Virginia was a stricken land. The impoverished planters in their time of need abandoned tobacco for indigo and went in for a series of politico-economic efforts at self-help. They used the two Two-Penny Acts, especially the second one, and the wartime slave duty acts to aid their own economic interests. But at the end of the French and Indian war conditions in Britain improved and crops increased in Virginia. The planters quickly lost interest in these self-help schemes and returned to raising tobacco for a world market.

During the years of prosperity the Virginians, particularly those in the Piedmont did well. But when crops fell off, British (and French) demand for tobacco declined, and British credit contracted. Then did the colonists become insolvent. Again in their time of need they turned against the merchants and mercantile credit and once again sought to put an end to the workings of a free money economy.

Microfilm copy of complete manuscript of 290 pages, \$3.63. Enlargements 6" x 8", 10¢ per page.

CONSTITUTION-MAKING IN INDIA

(Publication No. 3333)

Narayan Raghunath Deshpande, Ph. D.
Columbia University, 1951

Constitution-making is essentially a political process implying the definition of power relationships within a State. The character of a new constitution is determined by the composition and character of the Constitution-making body and the sanctions behind its work. A survey of the recent constitution-making in India reveals how substantially the character of the Constitution inaugurated on January 26, 1950, was affected by the historical background of the Constituent Assembly of India, its composition and the peculiar circumstances under which it assumed sovereign status through the transfer of

power by the British Government on August 15, 1947.

Constitution-makers have to face three basic problems relating to power, namely location of its source, its organization and distribution through the governmental structure and the objectives visualized for its use. The new Constitution of India provides for the creation of a Sovereign Democratic Republic in which power is theoretically vested in the people who exercise it through their representatives in the legislatures. Though a Republic, India continues to be a member of the Commonwealth. The Constitution provides for adult suffrage and direct elections on the basis of territorial representation. The abolition of communal electorates and the absence of any political safeguards for religious minorities are important features of the new Constitution.

The Constitution provides for a Federal structure with a double polity — of the Union and the States. The process of integration and unionization of the former Indian States led to a political unification and consolidation of the country during 1947-49 and the new constitution provides for uniform status for the States generally. In respect of the distribution of powers between the Union and the States and their financial and administrative relations, the new Constitution continues the framework of the Act of 1935 but with greater centralization. The territories of the States are not inviolate nor is their status coordinate with that of the Union. The Union Parliament can encroach upon State jurisdiction during emergencies and in the national interest during normal times. In fact it may be said that though the new Constitution is federal in structure it is Unitary in spirit. Centralization is its dominant note, and the Constitution-makers have deliberately adopted it in order to preserve and foster national unity.

The governmental system under the new Constitution is patterned after the British Parliamentary model though the head of the Republic would be an elective President. The governments of the Union and the States would both work as cabinet governments; the President of the Republic and the Governors and Rajapramukhs of States would act only as constitutional heads. In most respects the administrative structure under the previous setup has been continued under the new Constitution. A Supreme Court, however, is provided to interpret the Constitution, to act as the Federal Court and the highest Court of Appeal in the country.

The Constitution contains a Bill of Rights framed on the lines of modern democratic Constitutions, and following the American precedent, it also provides a judicial remedy for the enforcement of these rights. But the constitution-makers have also empowered the State to regulate these rights in the interest of its security. The Constitution also contains certain directives to the State which are not justiciable but which are meant to guide the State in its social and economic policies. The Directives are vague and very general and they reflect an attempt to bring together widely divergent views on basic issues of socio-economic reform held by members of the Constituent Assembly.

Three influences may be said to have shaped the

new Constitution — the decisive influence of Western ideas, the administrative outlook of the leaders of the Constituent Assembly who were also running Governments both of the Centre and in the States, and the partition of the country with the resulting one-party control of the state machinery (and the Constituent Assembly). The manner in which power was transferred in 1946-47 to the Indian people might explain the force of these influences and therefore the character of the new Constitution.

Microfilm copy of complete manuscript of 312 pages, \$3.90. Enlargements 6" x 8", 10¢ per page.

**CHURCH-STATE RELATIONSHIP
IN ENGLAND 1800-1840 AND ITS IMPLICATIONS
FOR PUBLIC EDUCATION**

(Publication No. 3612)

Ernest Morton Edmondson, Ed. D.
New York University, 1952

Church influence in English education is of long standing. At first, the Roman Catholic Church was in control, then, after the Reformation, authority was shifted to the Church of England. Religious instruction after the Reformation was a problem, because the Catholics and Dissenters differed with the Established Church. By 1800, there was agitation for State participation in education. To aid in an understanding of this Church-State conflict a background study has been made which deals with education and other aspects of English history from approximately 500 to 1800.

The contest over education from 1800 to 1840 is considered under four headings. First, the philosophy of the Church and State forces is established. The Church position in the nineteenth century is shown to have been based upon the canons of 1603 and the Acts of Uniformity. The position of the State forces is established by using speeches and writings of State spokesmen.

Second, the legislative outcomes affecting education from 1800 to 1840 are noted. Each law passed during this period dealing with education is abstracted to determine how it altered such educational practices as administrative control, curriculum, financial support, inspection and supervision of instruction, and the licensing and training of teachers. The nature of the modification is stated and compared to the rival positions of Church and State as expressed by accepted spokesmen of the two sides.

Third, each legislative act dealing with education during this period, whether the act became a law or not, is compared to the philosophies of the Church and State forces.

Finally, attention has been given to certain forces, events, and conditions which seem to have been associated with the State forces in winning a degree of ascendancy by 1840. For example, there is the work of liberals, the force of public opinion, select committees of inquiry, statistical societies, the press, and voluntary societies, such as

Mechanics' Institutes, the Society for the Diffusion of Useful Knowledge, and the Central Society of Education.

The following conclusions are derived from this study.

1. By 1840 the State forces had gained a degree of ascendancy in the education dispute.

2. Where there is more than one religious sect in a country, a government will probably encounter trouble in attempting to integrate religious instruction with public education.

3. Public schools should lead in the direction of free inquiry and the democratic faith, but the history of English education from 1800-1840 indicates much difficulty if the schools are ecclesiastically controlled.

4. The experience of England leads one to believe that public schools supported by taxes paid by people of all denominations should be for secular instruction only.

5. Schools supported by public funds should not be placed under the control of different religious denominations. This leads to a system of sectarian schools instead of public schools.

6. The struggle for control of education in England suggests that in the conduct of its public schools a government should adhere to a strict separation of Church and State.

7. Religious bodies which do not subscribe to the principle of civil control of education should expect no public funds for the support of their parochial schools.

8. One may question whether it is necessary to have formal religious instruction in order to have moral instruction.

9. Education does not seem to advance best if it is controlled for religious purposes.

Microfilm copy of complete manuscript of 313 pages, \$3.91. Enlargements 6" x 8", 10¢ per page.

**THE ERA OF GOOD FEELING:
FOUNDATION FOR DISUNION**

(Publication No. 3653)

Paul Chester Nagel, Ph. D.
University of Minnesota, 1952

The militant sectional sentiment which formed the basis for American disunion did not appear for the first time during Jackson's administration, as is commonly believed. Instead of resulting from the Garrisonian and Nullification movements of the early 1830's, the preliminary hostility between North and South emerged a decade earlier, during the presidency of James Monroe. Few citizens were misled by the superficial calm pervading party politics between 1817 and 1825 which gave the period its ironic title, the Era of Good Feeling. Although the appealing ambiguity of the Jeffersonian party had combined with the taint of the Hartford Convention to drive the Federalists from the political arena, the resultant factional quiet could not obscure the profound post-war

changes in the country's social and economic climate which were drastically to affect the political equilibrium of the Union.

During Monroe's administration several factors worked to transform the nascent sectional suspicions which had existed even before the Constitutional Convention into active hostility between North and South. Basic to this development was the growth of the view that the economies of these regions were mutually inimical. Between 1817 and 1825 sectional opinion crystallized upon the key issues of the protective tariff, internal improvements, the national bank and the uniform bankruptcy law. In these proposals the North beheld the requirements for the economic well-being of the national majority, while the South insisted these plans overwhelmed the rights of the minority and threatened destruction to the plantation system, leaving it no choice but to depart the Union. In congressional and journalistic debates each side accused the other of purely selfish motivation and warned that the federal system was not worth the cost of submission.

In this uneasy setting the question of Negro bondage was well suited to force the nation to examine the nature of the Union. The struggle over the admission of Missouri as a free or slave state was vivid evidence of the proximity of disunion, since it summed up all elements of the sectional conflict. As a result the South openly espoused the righteousness of slavery, while Northern opinion veered toward abolitionism. The free states insisted the federal government had power to determine the status of new members of the Union, while the South warned that such a contention menaced local prerogative, without which the slave system could not safely exist in the Union.

Southern alarm was intensified by the Northern delight over the vigorous nationalist decisions of Chief Justice Marshall. The slave states argued that in such opinions as *Cohens vs. Virginia* and *McCulloch vs. Maryland* the Supreme Court supported Northern plans for a tyrannical majority. The free states welcomed Marshall's views as a brilliant exposition of the need for a strong central government to assure national prosperity.

The political parties born in this era testify to the vivid impression made by the bitter quarrels of Monroe's presidency. Having come to the brink of disunion, American statesmen realized that hostility could be assuaged only by avoiding questions which emphasized the diversity between sections. Thus the cautious equivocations of the Whigs and Democrats found support in all areas of the nation. The ease with which topics like slavery, internal improvements and the tariff had split the nation along sectional lines in Monroe's period warned that a similar factional division would be catastrophic.

The events of Monroe's administration disclosed how differently the North and South had come to view fundamental questions, and how savagely each would defend its supposed interests. The sectional antagonisms which appeared in the Era of Good Feeling remained basically unaltered during the years of

cajolery and compromise which intervened before the Civil War.

Microfilm copy of complete manuscript of 417 pages, \$5.21. Enlargements 6" x 8", 10¢ per page.

SOVIET PREPARATION FOR TOTAL WAR, 1925-1951

(Publication No. 3588)

Ellsworth Lester Raymond, Ph. D.
University of Michigan, 1952

The purpose of this dissertation is to describe the history of civilian and economic preparation for war in the Soviet Union, and show how this preparation was partly responsible for the USSR victory in the Soviet-German war of 1941-1945. The period covered is from 1925 to the present, with the years 1914-1924 included as background. No attempt is made to present a detailed study of the Red Army, or of Soviet economy in general, since excellent books already exist in English on those subjects. As almost no non-Soviet literature exists on USSR civilian war preparation, this dissertation relies primarily on critical appraisal of Soviet laws, statistics, and official publications, all of which were surveyed for the period 1925-1951. The main conclusions of the dissertation are as follows:

Several leaders of the early Red Army were perturbed by the economic collapse of Tsarist Russia during World War I, and of Soviet Russia during the subsequent Russian civil war of 1918-1920. One of these leaders, Mikhail Frunze, invented and compiled a program for preparing Soviet civilians and economy in peacetime for war, to avoid such economic collapse during future hostilities. Frunze became War Minister in 1925, and succeeded in having his program adopted into Soviet Law. During the ensuing years of 1926-1940, this entire program was gradually put into effect, so that by the late 1930's the whole USSR lived in a state of peacetime mobilization.

These war preparations divide into six major categories: First, in industrializing under the Five-Year Plans, most emphasis was placed on building up the industries producing war materials or convertible to munitions manufacture. Second, much of this war-potential industry has been constructed in the Urals and southwest Siberia, far in the interior of the USSR. Third, since the late 1930's, armament production has been Russia's largest peace-time industry. Fourth, the USSR has made a deliberate attempt to achieve autarchy, especially in war materials. Fifth, Soviet economy and the Red Army are linked together by a complex network of mobilization offices, so that every large factory has a mobilization apparatus and every collective farm is included in mobilization plans. Sixth, vast peace-time training programs exist in schools, factories and cities to teach armament production technique to workers and engineers, and air raid precautions and elementary military training to civilians of both sexes.

These elaborate prewar preparations helped the USSR survive the early part of the Soviet-German

war, when the Nazis seized one-fourth of European Russia and half of USSR coal, iron and steel production facilities. The same civilian war preparation continues today, and gives the USSR a stronger economic potential than generally assumed. Weaknesses in this preparation are: over-concentration of convertible industry in a few giant plants, failure to achieve complete autarchy, insufficient civilian military training in rural areas, and poor production of military transportation equipment. Though there is some evidence that this civilian war preparation has been defensive as much as offensive, it is clear that the USSR talks peace with one hand, while it conducts tremendous preparations for war with the other.

Microfilm copy of complete manuscript of 367 pages, \$4.59. Enlargements 6" x 8", 10¢ per page.

CHAPTERS IN A HISTORY OF CRIME AND PUNISHMENT IN NEW JERSEY

(Publication No. 3026)

Henry Clay Reed, Ph. D.
Princeton University, 1939

Abstract not available.

Microfilm copy of complete manuscript of 618 pages, \$7.73. Enlargements 6" x 8", 10¢ per page.

THOMAS MORE AND THE FRIENDSHIP OF ERASMUS 1499-1517 A STUDY IN NORTHERN HUMANISM

(Publication No. 3553)

Jesse Kelley Sowards, Ph. D.
University of Michigan, 1952

The purpose of this study is to ascertain the extent of the influence of Erasmus upon Thomas More from 1499 to 1517, the period during which their personal association was most intimate. It is a study in humanism and is restricted to a consideration of that span of years in which More was most definitely associated with humanism and to those works which are of a humanistic character.

It is necessary to trace in relatively great detail the course of the friendship of the two men, the extent of which establishes proof of abundant opportunity for Erasmus to exert his influence upon More. The works produced by these men during and prior to this period are taken under consideration. It is shown that there was a constant development in Erasmus' literary work toward the reform of religious belief and practice in terms of his own clear, rational, and humane beliefs. In the early years of his association with More the outlines of this Erasmian "system" were already taking definite shape. There is thus established a relatively stable set of ideas and principles, traces of which can be sought in More's own work to associate him with the influence of Erasmus.

The focal point of this phase of the inquiry is the *Utopia*, More's greatest work and the one which marks the end of his essentially humanistic development. The ideas and principles of Erasmian humanism can be clearly seen in the *Utopia*, and it must be considered a distinctly humanistic work. Much of the argument of the book is an appeal to reason and an attempt to show the conscience of Christian Europe how far — with reason alone — a community may progress toward happiness and the good life. It is a reproach to Christian Europe and a plea for Erasmian sanity.

Finally, the influence of Erasmus upon More may be inferred from the constant support which More gave to all the works, the projects, and the principles of Erasmus in this period. He was always prepared to defend Erasmus from any critic who challenged the principles of the *Philosophia Christi* to which More himself so surely subscribed.

The conclusion which is drawn from the study is that Erasmus exerted a constant and profound influence upon the development of More as a humanist and that, in the years before the outbreak of the Reformation, the humanism of which More was a champion was essentially Erasmian. The presence of such an influence may be seen in his attitudes, his support of his great Dutch friend, and in More's works. Particularly evident is his debt to Erasmus in the *Utopia* which is the primary literary product of their friendship.

Microfilm copy of complete manuscript of 280 pages, \$3.50. Enlargements 6" x 8", 10¢ per page.

SOUTH CAROLINA POLITICS: 1815-1833

(Publication No. 3514)

Philip Frederick Wild, Ph. D.
University of Pennsylvania, 1949

This dissertation attempts to describe the interplay of local and federal politics in South Carolina. In order to do this, the plans and actions of the political leaders are detailed. The various developments that caused the State to relinquish nationalism for particularism receive special emphasis.

A brief description of the rapid rise and growth of the inland towns of the State is afforded. These towns became centers of political power. Then a survey of the work of the State Legislature in the opening half of the period is presented. Since the Legislature exercised centralized control over the activities of the State by means of boards and commissions, the various localities had to direct their appeals to the Legislature, and political bargaining resulted.

Attention is given to the political practices of the time. The men of the congressional delegations are viewed in their social and economic backgrounds. These individuals directed the political movements that took place. Much space is given to the involved accounts of the actions of these congressional leaders and their efforts to solve the situations created by the rise of the numerous aspirants for the Presidency, the emergence of the tariff, internal improvements, and Missouri questions.

Two factions developed among the Republicans; one was led by the Jeffersonian Republican, William Smith, and the other, by the Nationalist, John C. Calhoun. The triumphs and defeats experienced by these two leaders and their friends are narrated. The impacts of the movements for nullification and for a southern convention upon the factions are emphasized and new interpretations are offered. Throughout the discussion, greater stress and space have been afforded to Senator Smith and his faction, since the victorious Calhounites have heretofore received more attention from historians.

Microfilm copy of complete manuscript of 666 pages, \$8.33. Enlargements 6" x 8", 10¢ per page.

HOME ECONOMICS

FACTORS RELATED TO THE EXTENT OF MORTALITY AMONG HOME ECONOMICS STUDENTS IN CERTAIN COLLEGES OF MINNESOTA, WISCONSIN, AND IOWA DURING 1943-50

(Publication No. 3654)

Helen Young Nelson, Ph. D.
University of Minnesota, 1952

The investigation described here dealt with academic mortality among home economics students in fourteen colleges in Minnesota, Wisconsin, and Iowa. Involved were all of the students (2075) entering these institutions as freshmen from 1943-1948, who dropped out voluntarily before graduation between the fall of 1943 and the spring of 1950.

The extent of student mortality was determined by calculating the ratio of students withdrawing to the total group of freshman entrants to home economics. Mortality in large institutions (those with an average enrollment of 200 or more home economics majors) averaged 53 per cent; that in small institutions averaged 32 per cent.

College records furnished information as to age at entrance to college, credits earned, honor-point-ratio, and length of stay in college. Questionnaires returned by 68 per cent of those to whom they were sent furnished additional information: whether the student had transferred to another curriculum; personal and environmental characteristics; reactions to home economics courses and their prerequisites; reasons for enrolling in home economics; and personal data as to present status.

The respondents were very similar to the total group of drop-outs in terms of data available in college records. The statistical significance was tested of the differences found between the various groups on responses to questionnaire items.

Marriage was most frequently cited as the reason for dropping out of college; financial reasons were next. Those who transferred to another major did so

largely because home economics failed to hold their interest.

Certain factors appeared to be related to students' loss of interest and subsequent withdrawal: the duplication of subject matter and experiences from one learning level to another; the postponement of practical home economics courses until the later years of the curriculum because of heavy prerequisite requirements in the biological and physical sciences; the teaching of home economics courses with emphasis upon the theoretical rather than the practical aspects.

More of the respondents from large colleges than from small colleges criticized the number and difficulty of prerequisite requirements, the fact that practical courses were not offered soon enough, and that their home economics courses had been too theoretical. In contrast more of those from small colleges considered their elementary college courses had been a repetition of materials studied in high school home economics.

Home economics taken in senior high school had influenced respondents to major in this subject in college; home economics in junior high only had not been influential.

Lack of effective guidance and counseling before and during college seemed to be associated with withdrawal.

The following factors did not seem to be associated with withdrawal or the length of time students stayed in college: place of residence while at college, distance of student's home from college, church affiliation, participation in extra-curricular activities, and part-time employment while attending college. These data are difficult to interpret, however, because comparable data were not available for those who continued.

Three-fourths of the respondents were married at the time of the inquiry; the majority had married within a year after leaving college. Eighty per cent of those married were full-time homemakers, although most had worked outside the home after marriage. A third held jobs other than, or in addition to home-making, but few of these jobs utilized their home economics training.

Although many respondents offered criticisms of their college home economics courses, over three-fourths of those remaining a year or more in home economics were glad they had spent as much time as they had in this field of study.

Since so many students drop out before the end of the second year, home economics curricula need to be examined to discover if the needs of these students are being met. Placement of the practical courses sooner in the curriculum, teaching of elementary courses without prerequisites, and pre-testing to determine the most advantageous placement of able students might be tried.

Microfilm copy of complete manuscript of 141 pages, \$1.76. Enlargements 6" x 8", 10¢ per page.

HORTICULTURE

**STUDIES ON THE EFFECTS OF GROWTH-
REGULATING SUBSTANCES ON FRUITFULNESS
IN FIELD-GROWN TOMATOES
AND THE RELATION BETWEEN SEED
FORMATION AND THE PRODUCTION
OF GROWTH-REGULATING SUBSTANCES
IN THE FRUIT**

(Publication No. 3646)

Narendra Lal Dhawan, Ph. D.
University of Minnesota, 1952

Studies were made, first, to evaluate the effect of growth-regulating substances on fruitfulness in field-grown tomatoes when the substances were applied in transplanting solutions, in blossom sprays and in entire-plant sprays, and, second, to determine the influence of seed formation on the production of growth substances in tomato fruits. These studies were carried out in the field during the summers of 1949 and 1950 and in the greenhouse and laboratory during the winter of 1949-50.

In 1949 para-chlorophenoxyacetic acid (PCPA) used as blossom spray and alpha-chlorophenoxypropionic acid (CPP) used as an entire-plant spray when applied to male-sterile John Baer tomato plants resulted in considerable fruit development, but as soon as spraying was stopped fruit setting stopped. Growth substances CPP, PCPA, 2,4-dichlorobenzoic acid (2,4DB), beta-naphthoxypropionic acid (BNP) and 2,4-dichlorophenoxyacetic acid (2,4D) failed to induce fruit set on male-sterile John Baer tomato plants when applied in transplanting solutions to roots of plants.

In 1949 the various treatments when applied to normal John Baer tomato plants gave the following results: PCPA in a blossom spray had little effect on yield while CPP in an entire-plant spray significantly reduced early yield. In transplanting solutions, PCPA significantly reduced yields while CPP had little effect. Transplanting solutions containing 50 ppm. of 2,4DB increased early yields. Other transplanting-solution treatments had little effect on early yield. Total yields were reduced by all treatments except 2,4DB and Takehold (fertilizer having ratio of 10-52-17).

PCPA in blossom spray caused injury to aerial parts of the plants when applied with a pressure sprayer because the spray could not be confined to the flower clusters. When the growth substance was applied with an atomizer and the spraying confined to flower clusters, plant injury did not occur. CPP applied in entire-plant sprays also injured the aerial parts of plants. The leaves and growing terminals were deformed and twisted. PCPA in transplanting solutions stunted the plants but did not cause injury to aerial parts. Other transplanting treatments did not appear to injure the plants.

In 1950 2,4DB in concentrations of 25, 50, and 100 ppm. alone and in combination with Takehold was used in transplanting solutions. In addition, plants transplanted with water and those transplanted with

Takehold were given blossom-spray applications with solutions containing PCPA. The treatments were applied to Pritchard tomato plants.

It was found that treatments had no significant effect on time of flowering. PCPA applied in blossom sprays significantly hastened the ripening fruits and increased early yields.

Treatments containing 2,4DB in transplanting solutions depressed yields except when in combination with Takehold.

High positive correlations were found to exist between seed number and fruit weight in 1949 and in 1950 experiments, except with fruits from plants sprayed with CPP (entire-plant spray) and PCPA (blossom spray).

It was found that fruits containing seeds produced more auxin during early stages of development than did seedless fruits. Fifteen-day-old seeded fruits contained greater amounts of auxin than parthenocarpic fruits which had been induced to develop by application of PCPA to flower clusters. At the end of 30 days, seeded fruits still contained more auxin than did seedless fruits but the difference was not so marked. At the end of 50 days there were no differences in auxin content between seeded and seedless fruits.

Microfilm copy of complete manuscript of 60
pages, \$1.00. Enlargements 6" x 8", 10¢ per page.

**THE INBREEDING AND OUTBREEDING BEHAVIOR
OF CERTAIN STRAWBERRY CLONES
WITH RESPECT TO ASCORBIC ACID CONTENT
OF THE FRUIT AND FRUIT SIZE**

(Publication No. 3408)

Kenneth Warren Hanson, Ph. D.
University of Minnesota, 1952

The breeding behavior of strawberries with respect to ascorbic acid content of the fruit and fruit size was studied in two experiments employing progenies principally from inbred clones. These parental clones were descended from several commercial varieties through from one to three generations of artificial selfing. Selection had been practiced for desirable characters of plant and fruit but not for ascorbic acid content. For the first experiment the Marshall and Dunlap varieties, five inbred clones descended from Marshall, and four descended from Dunlap were used as parents. All were selfed and top crossed to Premier and the resulting progenies were grown in a split-plot field test. For the second experiment, four inbred clones descended, respectively, from the Chaska, Duluth, Early Bird, and Marshall varieties, were intercrossed in all possible combinations and the single-cross progenies were grown in a randomized block field test. In all, 953 seedlings were studied.

In the first experiment the ascorbic acid means of the self progenies indicated that five of the nine inbred clones were significantly better parents than the related variety, and none were significantly poorer, with respect to this character. In combining ability as

tested by top-cross means, two of the inbreds were significantly better and none significantly poorer than the related variety. The ascorbic acid means of the top-cross progenies averaged 87.2 mg. per 100 grams of fresh fruit in contrast to 973 mg. for the self progenies, revealing the depressing effect of the top-cross parent, Premier, with respect to this character and when used in combination with these parents. There was a highly significant correlation of +.83 between the means of selfs and top crosses.

With regard to fruit size (mean weight in grams), two of the inbred parents gave self progenies with significantly lower means than did the related Marshall variety, but all parents had relatively good combining ability with Premier. The mean weight per fruit was 46 per cent greater in the top-cross progenies than in the self progenies and there were no statistically significant differences between the top-cross progenies. The low correlation of +.27 between selfs and crosses was not significant. The variances for fruit size within the self progenies tended to decrease as the inbreeding of the parents increased.

The second experiment, on single crosses, revealed highly significant differences between crosses. Three of the four parents were found to transmit high ascorbic acid content, the other parent medium. The highest progeny mean, 134.5 mg., was found in the cross between inbred clones descended from Marshall and Early Bird, two varieties whose derived inbreds are known to have generally high ascorbic acid means.

Correlation studies between ascorbic acid content and fruit size in both experiments revealed no general relationship between these characters in the progenies studied. The only statistically significant correlation that was found, -.37 in one single-cross progeny, was too low to present any difficulty in a breeding program.

Microfilm copy of complete manuscript of 73 pages, \$1.00. Enlargements 6"x 8", 10¢ per page.

GENETIC EFFECTS OF REDUCED FERTILIZATION IN TOMATO FLOWERS

(Publication No. 3656)

Ralph William Richardson Jr., Ph. D.
University of Minnesota, 1952

The possibility of partially separating genotypes for vigor in the pollen and seed stages of development was investigated. An association between rate of F_1 pollen tube growth and pollen genotype might be used to modify F_2 segregation of zygotes and improve the F_2 generation for hybrid tomato production.

Experimental treatments used to modify and detect differential pollen tube growth included removal and non-removal of styles of emasculated and non-emasculated F_1 flowers at intervals of time after pollination. Fruits resulting from these treatments were cut into two equal halves at right angles to the

stem-blossom axis and seed extracted from each half separately. Seeds of the treatments were graded into three sizes, large, medium and small.

Removal of the style from flowers 24 hours after pollination reduced fruit set and seed production. Emasculation of flowers and removal of the style 24 hours after pollination caused an increase in mean weight per seed.

Fewer seeds were produced in the stem halves of fruits than in the blossom halves. An association between mean weight per seed and number of seed formed was suggested by a correlation of -.329 between the two characters.

Large size seed tended to give higher germination percentage throughout the material. This advantage of large seed was not carried over into any later stage of development however. The only other difference attributable to seed size was a lower number of recessive phenotypes for leaf type in the segregating population.

Segregation for leaf type was influenced by non-style removal, resulting in a deficiency of the recessive phenotype cc, potato leaf. Stem half seeds likewise showed a deficiency of the recessives. It was not clear whether reduced viability of the recessives or competition among pollen tubes caused the deficiencies. A reduced percentage of recombination between sp, determinate growth habit, and c, leaf type, resulted from style removal 24 hours after pollination.

Plants produced by seeds of the stem halves yielded more early fruit than plants from blossom half seeds. The difference between halves was greatest in the style not removed treatment, that is, in normally set fruit.

While differences were not significant, there were tendencies for stem half, style not removed seeds to produce a greater total yield than blossom half seeds of the same treatment.

Fruits growing from seeds of the style not removed treatment were different in shape from style removed and approached a round shape. It appeared that pollen tubes competed during the period of development and that there was an elimination of genotypes for low early yield and elongate fruit shape in fruits which set as a result of non-style removal.

Microfilm copy of complete manuscript of 68 pages, \$1.00. Enlargements 6" x 8", 10¢ per page.

LANGUAGE

DOWN-EAST BALLADS AND SONGS

(Publication No. 3600)

Horace Palmer Beck, Jr., Ph. D.
University of Pennsylvania, 1952

Although the study of ballads and folksongs first began in this country in New England, it has been over a quarter of a century since any substantial work has

been done in this area. The present work was undertaken to see what was the condition of folksinging in Maine, in many respects the most primitive area in the region, at the present time as compared to its known condition twenty-five years ago. To this end a collection was started that, although not complete in its coverage, encompassed the various geographic areas of the state, namely the seacoast and the forests.

As a result of the field work, one hundred and thirty songs were collected, of which one hundred and twenty are published in this dissertation. These songs, it was discovered, fell into three distinct categories, songs sung around the home, songs sung in the logging camps and songs sung aboard ship. It was therefore felt advisable to divide the dissertation into three major chapters, one on each of the major groups represented.

Chapter one deals with songs sung around the home. It contains an introduction wherein is discussed the following problems, the state of singing today as compared to twenty-five years ago and earlier, conditions that aid in or detract from the singing of folksongs, the part played by folksong in the culture of the people, where the songs came from originally, how Maine folksongs and the singing of them differ from other regions of the United States and, finally, it discusses whether or not there was any singing in the region in colonial times. Following this introduction the songs are arranged into groups. First come the Child Ballads, then European and Canadian broadsides followed by American broadsides and folksongs, arranged as nearly as possible in order of antiquity.

Chapter two deals with logging songs. The introduction contains a brief sketch of the history of logging and demonstrates how these songs fit into the lumbering culture. It points out what factors in the development of the lumber industry aided in and which factors detracted from the growth and perpetuation of these logging songs. This introduction is followed, as in chapter one, by songs — this time about logging, arranged in chronological order beginning with the oldest woods song and ending with the newest.

Chapter three follows exactly the same pattern as chapter two, but deals with ships and shipping instead of logging.

Following these three major chapters there are two brief discussions of small groups of songs that did not fit clearly into any of the three general categories mentioned before. One of these discussions is concerned with bawdy songs and examples; the other tells how songs are made and gives examples. Beside these two brief studies there is a considerable study of the ballad "The Flying Cloud" wherein it is demonstrated that this song is probably older than it is usually believed to be and may possibly be an amalgamation of two extremely old songs into a newer one.

Of the songs presented here, twenty-five have never been collected before. The others have been collected a varying number of times from various places. Each song has been given a selective

bibliography, and, wherever it was thought prudent, notes were included explaining and discussing aspects of the song hitherto unnoted.

Microfilm copy of complete manuscript of 433 pages, \$5.41. Enlargements 6" x 8", 10¢ per page.

A VOCABULARY OF AMERICAN SPANISH BASED ON GLOSSARIES APPENDED TO LITERARY WORKS

(Publication No. 3579)

Ella Nancy Cowles, Ph. D.
University of Michigan, 1952

The vocabulary was compiled in view of the inadequacy of existing dictionaries in treating American Spanish words and with the object of making available for literary and linguistic investigation one of the best sources of lexical information regarding dialectal usage and geographical diffusion of words and phrases.

The vocabulary, consisting of approximately eight thousand entries, presents the regional and popular words and phrases as defined in one hundred one glossaries which were appended to Spanish-American literary works because of the writers' desire to reach a world-wide reading public in spite of the provincial and popular language they used. The glossaries are of two types: (a) those, totaling eighty-four, which were supplied by the authors themselves; and (b) those prepared by the editors and scholars and numbering seventeen.

The texts selected for their glossaries represent the novel, essay, short-story, and poetry, from the first part of the nineteenth century to the present, but the majority were written after 1910. According to the native countries of the authors, all of the Spanish-American countries are represented in the vocabulary except Paraguay.

Each definition in the vocabulary is identified by (a) author; (b) text in which the word or expression is used; and (c) areas to which it applies. The definitions have also been compared with the similar ones in three standard dictionaries, and each case of agreement has been noted. The following dictionaries were used: (1) *Diccionario de la lengua española* (1947) by the Real Academia Española; (2) *Diccionario de americanismos* (1931 and 1946) by Augusto Malaret; (3) *Diccionario general de americanismos*, 3 vols., (1942) by Francisco J. Santamaría. The results of this comparison revealed that the vocabulary usually gives meanings which show a closer synonymy and relevance to the usage in their dialectal areas. In addition, the vocabulary contains thousands of others, many of which are omitted entirely from the dictionaries by reason of the fact that they are familiar, or slang, expressions.

The compiler of the vocabulary has supplemented the definitions with the following information:

1. Etymological data pertaining especially to the indigenous, European, and American borrowings.
2. Geographical distribution in Spanish-America, including New Mexico and Louisiana, as given by the

texts, dictionaries, and Professor Lawrence B. Kiddle's files.

3. Frequent examples of usage in Spanish-American texts to substantiate the definitions.

4. Grammatical identification whenever it was assured.

5. Numerous editorial comments in English regarding the words.

The vocabulary is preceded by an introduction in English informing the user concerning the characteristics of American Spanish which appear in the vocabulary as follows: (1) External factors: Indigenous borrowings, Africanisms, Anglicisms, Gallicisms, Brazilianisms, Italianisms, etc. (2) Internal factors: Archaisms, neologisms, new formations, phonological change, and semantic modifications.

As a whole, the vocabulary is a valuable supplement to all existing Spanish dictionaries and affords a new source of material of a lexical nature in American Spanish.

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THE T'AI SHAN DIALECT

(Publication No. 3073)

Tung Yiu, Ph. D.
Princeton University, 1946

This study is but an attempt to give a descriptive analysis of a Chinese dialect known as the T'ai-shan — a dialect which is the most important member of the Ssu-i group of Cantonese. Although this dialect belongs to the Cantonese group, it is almost unintelligible to the natives of Canton. Important as it is from a linguistic point of view, it has been neglected to a great extent. Some ten years ago, however, the Academia Sinica sent members to the district to record the sounds, but owing to difficulties, their task was not finished.

The present study is not merely to give an analysis of the sound system, but also its grammatical constructions, sentence types, nouns, verbs, and particles. Because the Chinese language has neither inflections nor conjugations as in the Indo-European languages, its grammar must be studied from a scientific point of view. As a result, one will find the word classes much simplified.

The sound system of the T'ai-shan is simpler than, and the tonemic system is not as complicated as, Standard Cantonese. The low rising tone is completely lost in the T'ai-shan, while the *s*-affricates /ç(r), ʃ(r)/ and voiceless sibilant /s(r)/ have been replaced by the 1[-affricates] /ʃ ʃ/ and voiceless dental spirant /ʃ/ respectively.

Like Cantonese, the T'ai-shan has a number of loan-words from English. The word-order of the sentence sometimes agrees with the Cantonese and differs from the Mandarin. For instance, the order in the T'ai-shan is subject plus verb plus non-personal object plus personal object while the order in

the Mandarin is subject plus verb plus personal object plus non-personal object.

The sentence falls into three types: narrative, equational and imperative. They are usually followed by final particles which help to modify the shades of the intensity of feelings. Together with the sentences there are given negative and interrogative particles.

Under verb expressions, coverbs, noun expression attributes, secondary verbs, and auxiliary verbs are separately treated. Secondary verbs are the most productive, and a large number of resultative compounds are formed with them attached to the head verbs.

For noun expressions, one will find five types: ordinary nouns, interrogative nouns, deitic nouns, numerals and measures. The peculiar linguistic feature is that the three personal pronouns possess distinctive forms for the singular and the plural number.

With regard to word-formation, the T'ai-shan resembles Standard Cantonese. For the members and relatives of the family ㄅㄨ usually precedes the noun. Again, the diminutive ㄅㄨㄟ 'son' is profusely used in combinations, and sometimes entirely loses its original meaning.

Of the phonetic data, the stories were most carefully selected. Nearly all of them reveal the local color of T'ai-shan. The ghost story is but one of the thousands prevailing among the natives. The proverbs were noted down from time to time from the informant Mr. Ang when he spoke in ordinary conversation. The ballads, though only twelve in number, will undoubtedly give the reader a picture of the life of the common people.

The list of words appended forms as important data for the study of the dialect as do the sentences or stories. The Chinese-English glossary is clearly arranged according to a new order. For convenience sake, nouns and verbs are marked. The variant pronunciation, if known, of the city for some words is also given. This detailed description will perhaps contribute toward a comparative study of this dialect either with the Ssu-i group or with Standard Cantonese.

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LITERATURE

A CRITICAL STUDY AND TRANSLATION OF THE ARABIC AND PERSIAN SOURCES CONCERNING THE SAFFĀRID PERIOD

(Publication No. 2908)

Yahya Armajani, Ph. D.
Princeton University, 1939

Abstract not available.

Microfilm copy of complete manuscript of 341 pages, \$4.26. Enlargements 6" x 8", 10¢ per page.

THE EVOLUTION OF ELIA CHARLES LAMB:
THE MAKING OF AN ESSAYIST

(Publication No. 2910)

George Leonard Barnett, Ph. D.
Princeton University, 1942

The *Evolution of Elia* is an examination of the forces which influenced Charles Lamb to employ the Essay as a medium of expression and of the processes by which his essays grew and developed from the inception of the basic ideas to their final form. The purpose of this dissertation is to determine and indicate these forces and processes, thus making the uniqueness and perfection of Lamb's work more comprehensible and his position in the history of the English Essay more definable than they have hitherto been. Although Lamb has received the attention of a great many writers, most of them have occupied themselves with panegyric and appreciation rather than criticism and analysis. On the premise that Charles Lamb and his essays are deserving of additional scholarly attention, I have sought to utilize materials, which are available, in a more complete interpretation of his evolution as an essayist and of his essays as outstanding examples of their type.

This study is concerned first with outlining the steps by which Lamb was led to write essays. His position in, and his contribution to, the growth of the familiar essay is here defined more exactly by a consideration of his writings in relation to those of his predecessors and of his contemporaries. Lamb is now revealed, not as a creator of a new form of literature, but as a vitalizer of elements existing in essays since the time of Montaigne. The Lambian self-revelation is found to be the result of an admirably suited temperament and innate skill combined with considerable knowledge of the achievement of his predecessors. Lamb did not invent the familiar essay, nor was he original in his choice of subjects; his contribution lay in his manner of treatment.

With the help of Lamb's correspondence — recently made available for study in a more complete form than ever before — the germinal ideas of many of the essays are traced for the first time to their inception in their author's activities, reading, and conversation. I have also carefully analyzed the letters to show the extent and nature therein of the first translation into words of ideas later formed into essays. As a part of this revelation of the growth of Lamb's prose creations, numerous verbal and thought parallels have been indicated between the letters and the essays. The importance of Lamb's correspondence as a means of interpreting the prose he wrote for publication and as a place where he could try out ideas and expressions has not previously been fully estimated.

A selective examination of all sources of information about Lamb has resulted in a clearer picture of his writing habits — how, where, and when he wrote his essays. The so-called literary tradition of the East India House is defined, and its influence

on Lamb is measured. Although his essays were in constant demand at the peak of his literary career, he maintained the highest standard and refused to publish an essay until he had revised it to his complete satisfaction.

My investigation of manuscript material owned by the Morgan, Huntington, Harvard, and New York Public libraries, supplemented by facsimiles printed in sales catalogues difficult of access, has succeeded in dispelling much of the mystery concealing the means by which Lamb perfected his expression. Although no such extensive use has hitherto been made of these manuscripts, nonetheless I have drawn deductions from Lamb's revisions which reveal him as a painstaking creative artist who wrote slowly and with difficulty and was not easily satisfied. Some of his happiest word choices are found to be the result of long thought and much trial and error. Many bits of now familiar phrasing were the result of mere substitution to avoid repetition.

Finally, I have given particular attention to Lamb's prose style with a view to determining the factors which helped to form it and the qualities which go to characterize it. The adduced evidence shows that many of its peculiar qualities can be traced to his writing of school exercises rather than to his imitation of favorite old authors. A special inquiry into Lamb's use of quotations helps us to understand why he gained preëminence as an essayist; it reveals new facts about the extent and variety of his reading; and it proves his memory to have been exceptionally retentive. Although Lamb's love for the books of seventeenth century authors is confirmed by finding that he quoted from the prose of that period more than twice as much as from that of the eighteenth century, it is startling to discover that Pope is quoted as much as Spenser, and that, exclusive of the drama, Lamb's essays contain more quotations from the poetry of the eighteenth century than from that of the fifteenth, sixteenth, and seventeenth centuries combined. It is also new to find that there are as many quotations from Restoration drama as from that of the Elizabethan and Stuart periods together. As for Lamb's prose style in general, I suggest that the correspondence of particular features with those of authors he read was less the result of conscious imitation than of mental affinity to those authors. In short, my investigation indicates that Lamb's style was more essentially his own than critics have led us to believe.

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PURITANISM IN NEW ENGLAND FICTION
1820-1870

(Publication No. 2921)

Charles Burnell Brooks, Ph. D.
Princeton University, 1943

The best known interpreter of Puritanism in American fiction is, of course, Hawthorne, but so great is his reputation that he is frequently looked

upon as its only interpreter. This thesis is a treatment of Hawthorne's predecessors and contemporaries who also dealt with Puritanism, in many cases using the same themes and subjects that Hawthorne employed.

These writers were on the whole more interested in contemporary issues and more liberal in their theology than he was. One of the most important elements of Puritanism that interested them was Calvinistic theology and its conflict with more liberal systems of worship — particularly Unitarianism. The first New England author to deal with this problem was Catherine Maria Sedgwick, whose novel, *A New-England Tale*, 1822, was an attack on the orthodox faith. Lydia Maria Child's *Hobomok*, 1824, deals with the founding of Naumkeag, or Salem, and also contains an attack on Puritan orthodoxy. In the same year appeared Harriet Vaughan Cheney's unfortunately little-known work, *A Peep at the Pilgrims in Sixteen Hundred Thirty-Six*, also in part an exposure of Puritan intolerance and bigotry. In 1827 Sarah Josepha Hale in *Northwood* again defended liberalism in theology.

After the efforts of these ladies there came a long series of works by writers on Puritan subjects. The witchcraft delusion, the legend of the regicides, Puritan persecution of Quakers and of other individuals, and the opposition between the old and the new in religion — all these subjects provided the authors with opportunities to discuss Puritanism; and frequently, like the writers described above, these authors criticized Puritan sternness and cruelty. James McHenry's novel, *The Spectre of the Forest*, 1823, combines the themes of witchcraft and the regicides, setting a precedent which was to be widely followed by later writers, for example by William Leete Stone in "Mercy Disborough: A Tale of the Witches," and by James Kirke Paulding in *The Puritan and his Daughter*, 1849. Witchcraft forms the substance of Neal's *Rachel Dyer*, 1828, and Josiah Gilbert Holland's *The Bay-Path*, 1857. Puritan persecution of the Quakers is the theme of Mrs. Eliza B. Lee's novel, *Naomi*; and John Lothrop Motley's work, *Merry-Mount*, deals with the treatment of Morton by the Puritans. All of these writers, however, follow the tradition of the early novelists in treating of Puritan theology, comparing it with the more liberal systems of worship which appealed to the authors. Sylvester Judd was the most radical in this respect, for his novel, *Margaret*, 1845, went far beyond the Unitarian position of the others to become definitely transcendental in nature.

Harriet Beecher Stowe provides the best example of a New England writer interested in the theological aspects of Puritanism. Raised under the strict orthodox tutelage of her Calvinistic father, she gradually broke away from orthodoxy to become much more liberal. *The Minister's Wooing*, 1859, and *Oldtown Folks*, 1869, illustrate her liberalism, containing as they do, besides delightful descriptions of New England character and manners, many comments on the strictness and narrowness of Puritan orthodoxy.

Hawthorne, too, was concerned with these theological problems, despite his profession that he lived

apart from the exciting issues of his day; but unlike most of the other writers, he was conservative, expressing his preference for the older faith and clergy as compared with the "cold, lifeless, vaguely liberal clergymen of our own day."¹ Thus he satirizes extreme liberalism and visionary reformers in such tales and sketches as "The Celestial Railroad," "Earth's Holocaust," "The Christmas Banquet," and *The Blithedale Romance*. The subject of almost every one of Hawthorne's tales with a New England background can be shown to have been used before. Thus "The Gentle Boy," "The Grey Champion," and "Young Goodman Brown" deal respectively with Quaker persecution, the regicides, and witchcraft, the three most popular themes in New England fiction. Hawthorne is different from his predecessors in his interest in character analysis and his constant use of symbolism.

The Scarlet Letter is the summation of the efforts of these writers to represent Puritanism in fiction. Where other works, on the whole, were either denunciations or at most half-hearted defenses of Puritanism, *The Scarlet Letter* is both a defense and an exposure, illustrating the harshness of the founding fathers and yet pointing out the tendency of the society they founded to ennoble individuals — to temper them in the hot fire of religious discipline. The Puritan society is at once the cause of the tragedy and the means of the purgation. Hawthorne shows his dependence on Calvinism in his emphasis on sin in the novel, yet the torture the characters undergo provides a means of making them aware of God's infinite mercy and assuring them that eternal salvation has not been denied. A Puritan could desire no more from life than the assurance that he would be with God after death.

1. *American Notebooks*, Edited by Randall Stewart, p. 158. Quoted in Austin Warren's edition of Hawthorne in the *American Writers Series*, p. xxii.

Microfilm copy of complete manuscript of 247 pages, \$3.09. Enlargements 6" x 8", 10¢ per page.

DR. JOHNSON AND THE CHRISTIAN TRADITION

(Publication No. 2923)

Stuart Gerry Brown, Ph. D.
Princeton University, 1937

Abstract not available.

Microfilm copy of complete manuscript of 232 pages, \$2.90. Enlargements 6" x 8", 10¢ per page.

"THE GREAT AMERICAN NOVEL": A STUDY IN LITERARY NATIONALISM, 1870-1900

(Publication No. 3573)

Charles Alexander Campbell, Jr., Ph. D.
University of Minnesota, 1952

Although "The Great American Novel" was an ill-defined literary concept, it was a focal point in the

literary theories of the generation of American critics and writers living between 1870 and 1900. The professional authors of these decades concerned themselves in all seriousness with the relation of American literature to national life.

The investigator of this relation finds himself faced with nationalism, a term exceedingly difficult to define adequately. I have taken nationalism to mean a state of mind among members of a nationality that leads to the conviction that the nationality constitutes not only a distinct political entity but a cultural whole as well. Because nationalism signifies, moreover, the building of the modern institution of the national state, we find the "ideal" of nationalism reinforced by the "reality" of intranational politics, communication and commerce. Scant attention has been paid, however, to the effects which physical nationalization has wrought on an idealistic nationalism rooted in popular sovereignty. In America, for instance, individualism seems to have been warped into a mould of conformity and the intellectual vogue of romanticism supplanted, under the aegis of the industrial revolution, by what has conventionally been termed "realism."

The critics, writing chiefly in the periodicals, in the period between 1870 and 1900 were concerned, more or less clearly, with these changes. Although many writers were indifferent, there were enough perceptive men who indicated their reactions to the idea of nationalism to make the study of their positions meaningful.

In no other place is the relationship of literature to nationalism brought into better focus than in the discussion which the great American novel provoked. Although the primary concern of the disputants was with literature, a background of nationalism was implicit in every argument. The pattern of the discussion is fairly clear: critical opinion moved from skepticism or even denial of literary nationalism to a full acceptance of the idea that the American novelist's responsibility was to reflect American life and ideals in one all-inclusive work.

Although this idea seems mere provincialism, the evidence reveals a clearer recognition of the course of American nationalism than the simple demand for a great national work of literature would indicate. Critics who avowed that poetry was no longer the medium for national expression felt that it was inadequate to express man's new role as a social being rather than as an epic individualist. In like manner, the demands for fictional handling of (1) a native setting, (2) native character types, (3) peculiarly American activities, notably politics, and (4) peculiarly American ideals indicate the sentiment that the great American novelist must somehow find a central force in the American complex of activities and setting.

It would be misleading, however, to state that there were no qualifications accompanying these demands for insights into national institutions. Even those critics who most warmly anticipated the great American novel refused, until late in the period, to look at the American present. Despite the opposition of these "idealists," a number of

writers like Frank Norris and Paul Leicester Ford attempted to put into practice the theory of the great American novel. Their efforts suggest that criticism was at least aware of the dual nature of modern nationalism.

Perhaps the American novelist's inability to conceive a great American novel in response to criticism is indicative of the artist's reluctance to accept conformity as the basis of modern national society. The great American novel represented, in literary terms, the faith of nationalism, yet in the physical fulfillment of the faith lay, paradoxically, the seeds of destruction. The physical nationalization which accompanied the expansion of the corporation and the trust served not only to minimize individualism but also created a complex society in which it was virtually impossible for the artist to find the central focus which the concept of the great American novel demanded.

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**"SOME THANKFULNESSE TO CONSTANTINE":
A STUDY OF ENGLISH INFLUENCE UPON
THE EARLY WORKS OF CONSTANTIJN HUYGENS**

(Publication No. 3330)

Rosalie Littell Colie, Ph. D.
Columbia University, 1951

This thesis is a study of a seventeenth-century figure important both in his own country and abroad, Constantijn Huygens, the Dutch poet-diplomat (1596-1687). Huygens' life is of importance to scholars because of his own versatility and manifold talents, and because of the great influence he exerted upon his son, Christiaan Huygens, the physicist, astronomer, and mathematician.

At the beginning of his career, in 1618, 1621-22, and 1624, Constantijn Huygens made three journeys to England which had considerable influence upon his receptive and alert mind. Since England was the first foreign country he visited, the first broadening of his tolerant understanding came from contact with "other habits and cities" in the British Isles. Poetically, he was considerably stimulated by forms of English literature which were new to him: he was, for instance, the first to introduce into Dutch the "character"-poem so common in English, and some of his social satire bore the mark of his experiences at the English court. Most significant of all was his translating into excellent Dutch verse nineteen lyrics of John Donne. The difficulties Donne's English presented he and his contemporaries fully realized, and his translations were properly admired in his literary circle.

The other major influence upon him from English life — one of great meaning for both Constantijn's life and that of his son Christiaan — came from English science, which struck his imagination with unexpected impact. Bacon's great plan for organizing all knowledge aroused Huygens' response and an interest in empirical science which continued all his life. Thirty

years after his first reading of Bacon, Huygens was instrumental in the Netherlands publication of Bacon's work by the Gruterus brothers. Through Cornelis Drebbel, a Dutch experimenter and "innovator" in King James' service, Huygens was made aware of the importance of individual research, a necessary practical complement to Bacon's theories. The young man carried back to Holland several instruments of Drebbel's manufacture — lenses, a camera, and a microscope.

The microscope was of particular importance in the liberation of Huygens' ideas, as his poem "Daghwerck" showed. Among the many subjects he discussed in that poem, Huygens described his observations through both telescope and microscope and the new ideas of relativity, both mathematical and philosophical, which he gained through his use of instruments. In "Daghwerck" Huygens proved himself a thorough-going "modern" in the new science. In the Baconian tradition, he was "practical" as well: along with his ideas on the structure of the heavens, the earth, and man's body, he described his own experiments in medicine, cosmetics, and cookery.

Constantijn Huygens, poet, diplomat, virtuoso, musician, patron of the arts, and amateur of science, was one of the most attractive and talented men of his versatile and varied period. He was, too, one of the few Hollanders whose lives formed a real liaison between the Dutch Republic and England in the early seventeenth century. If this were his only value to students of English literature it would be enough, I think, to warrant study of his life and works. He was so much more, though, that the value of his English experiences lies in more than their historical interest, but in the development of the manysided man of genius he was.

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ENGLISH SERMON-WIT: 1550-1660

(Publication No. 2945)

Clement Wilson Fairweather, Jr., Ph. D.
Princeton University, 1942

Abstract not available.

Microfilm copy of complete manuscript of 300 pages, \$3.75. Enlargements 6" x 8", 10¢ per page.

ENGLISH PSALMODY AND ISAAC WATTS

(Publication No. 2949)

Donald Rodgers Fletcher, Ph. D.
Princeton University, 1951

Section I, 'The Idea of the Metrical Psalm-Version,' takes up the beginnings of psalm-paraphrase in English in the Anglo-Saxon and Middle English periods and moves on to consider sixteenth-century devotional psalm-paraphrases. Some space is given

to this review since I have not found the subject studied in any source.

The beginnings of English congregational psalmody are then traced from Coverdale, the Wedderburns and Crowley and the period of German influence to Sternhold, and through the Genevan period and the influence of the Huguenot Psalter to the emergence of the completed Old Version in 1562. Archbishop Parker's psalter of 1567(?) is compared.

Not attempting to follow the complicated history of psalmody through the century and a half from the Old Version to Watts, the last part of Section I takes up three emphases that developed successively in the tradition, the emphasis on literalness, keeping as close as possible to the Hebrew original, the emphasis on fluency of English poetry even at some cost to literalness, and the emphasis on appropriateness to Christian worship. These emphases are studied as they appear in ten of the more outstanding metrical psalters such as the New Scottish Psalter, Wither's, the New Version, and Patrick's, including those used by Watts in preparing his version. The section concludes with a summary of Watts' theory as stated in his 'Short Essay on the Improvement of Psalmody.'

Section II analyzes Watts' technique of psalm-paraphrase, studying his treatment of the structure of his Hebrew originals, his metrical technique, and his treatment of content, including the vocabulary and imagery he uses.

Section III takes up Watts' unique contribution to English psalmody, his Christianizing of the Psalms. The first chapter of this section, Chapter 9, discusses the way he puts Christ into the Psalms by taking hints from the New Testament as a commentary on his text, by interpreting various objects and persons as types of Christ or seeing allegory, an elaborated typology, in more extended passages, and by deliberately reading Jesus Christ in the place of Jehovah or putting Him in the place of the psalmist who is reciting.

In Chapter 10 Watts is seen at work making the Jew Christian throughout the Psalms, adapting Palesinian place-names to Christendom and changing references to Jewish cosmology and history to harmonize them with eighteenth-century English ideas. Jewish ethics also must be altered to take on a more Christian cast.

Chapter 11 shows the final metamorphosis of Hebrew poet into English Dissenter. Watts' paraphrases are shaped by his prepossessions as an Englishman, a Christian minister, and a Dissenter.

In preparing his versions Watts continually had before his mind his own congregation of Independent worshippers and all English Christians of his day. Calvinistic but non-sectarian, he tried to give them a psalmody that would meet their spiritual needs, whatever their church. His achievement made his name a household word for two centuries and gave to English-speaking Christians some of their finest hymns.

There are two appendices. Appendix I is a bibliography of complete, or nearly complete, metrical versions of the Psalms in English from 1548 to 1800. I have not found such a bibliography in any source-book. Many of the items it includes are available in the extraordinary Benson Collection of Hymnology in

the Library of Princeton Theological Seminary. Appendix II, which supplements Section I, is a compilation of quotations taken from the psalters mentioned in the historical review. To facilitate comparison most of these are versions of one psalm, the *De Profundis* (Psalm 130).

Microfilm copy of complete manuscript of 277 pages, \$3.46. Enlargements 6" x 8", 10¢ per page.

ADDITIONS AND REVISIONS IN THE SECOND
EDITION OF BURTON'S *ANATOMY*
OF MELANCHOLY
A STUDY OF BURTON'S CHIEF INTERESTS
AND OF HIS STYLE AS SHOWN IN HIS REVISIONS
(Publication No. 2959)

Robert Gordon Hallwachs, Ph. D.
Princeton University, 1942

The *Anatomy of Melancholy*, first published in 1621, was revised and enlarged in the edition of 1624, and in the succeeding editions of 1628, 1632, 1638, and 1651 as well. The changes appearing in the second edition, which are representative of those in the later editions also incorporating Burton's revisions and additions, show much about Burton and his book. They reveal, first, the deliberate care Burton took in revising and adding to *The Anatomy of Melancholy*. They also make clear the conscious artistry of his prose style and show in what ways he worked deliberately to improve that style in the new edition of his work. Finally, and perhaps most important of all, they emphasize and throw into sharp relief his predominant interests and opinions, and thereby point to what were his real purposes in writing this book.

Although Burton, writing in the second edition of *The Anatomy*, belittles what few revisions he admits having made in preparing this new edition of his book, the plain truth is that those revisions are extensive and careful. Although he cuts out little of what had appeared in the first edition, he makes many alterations. He changes words and revises phrasing on almost every page to achieve better expression. To many a passage that in 1621 had stood only in Latin he now adds his own translation or free paraphrase. Some material that had been relegated to notes in 1621 now appears in the text, sometimes revised and expanded. Burton's postscript to his first edition, *The Conclusion of the Author to the Reader*, disappears as a separate unit, but about two-thirds of its material reappears in appropriate places in *Democritus Junior to the Reader* and in the Preface to the section, 'Love-Melancholy.' The rearrangement helps to focus and unify much that had been dispersed and spread thin before. Burton's manner of adding new material often gives proof of how carefully he has read over the old. Sometimes he corrects or completes a reference; sometimes he reinvestigates the source of some borrowed passage, drawing upon it anew for material to be added to what he had borrowed before. He takes pains to

make added passages dovetail smoothly into his old text, and he frequently concludes a lengthy new passage with a transitional phrase designed especially to lead back into the text of 1621 and to cover the break in continuity. It is clear that he is a careful workman.

Burton's revisions show his interest in style by revealing not only his efforts to correct and improve the construction and organization of his writing, but also his improved use of various rhetorical devices and of certain forms of prose rhythm. He ties up the loose ends of his writing by finishing incomplete sentences, clarifying the reference of pronouns, cutting out redundancies, reducing excessive coordination, improving the logic of statements, and adding transitions and summaries to pull together his ideas. The result is greater clarity, better continuity, and more close-knit organization. He likewise gives attention to the rhetorical effectiveness of his writing and improves it in many ways. He makes his diction more exact, appropriate, and specific by many changes and by many additions of particular details, especially to his numerous heaped-up catalogs of words. He gains greater vividness in many passages by increased use of 'sound-effects' and dramatic dialogue. His phrasing shows more variation; exact parallelism he reserves more and more for places of emphasis. He uses rhetorical devices based on repetition — especially epizeuxis and plocche — with far greater mastery than in 1621. He also shows greater concern for creating mounting interest and climax in extended passages. And finally, he shows here new evidence of a feeling for prose-rhythm, especially in large-scale rhythmic movement based mostly on antithetic balance of phrases or on repetition, in sentence rhythm based on the repetition or gradation of a metrical pattern through a series of phrases, and in cadence. He improves his use of such forms of prose-rhythm by more skillful use of variation in repeated patterns of phrasing, and by better adaptation of the movement of his writing to its spirit and meaning. All this evidence shows that Burton is more than just a careful workman; he is a skilled and conscious artist.

Last, Burton's revisions and additions here throw into sharp relief his chief interests and purposes in writing. His comparative neglect in 1624 of those parts of *The Anatomy* dealing with physiology and medicinal physic, and his many additions to other parts describing all human discontent and unhappiness show that his primary purpose is not to anatomize melancholy as a disease of the body, but to describe melancholy as a term for all human misery. That this purpose is not merely descriptive is shown by the increased attention he gives to interpreting such melancholy in terms of morality and religion. His castigation of private vice and public corruption and oppression, and his insistence on the fact that all human misery is the product of man's sinful nature and can be cured only by God's mercy and grace — these show that Burton the churchman is writing this book. But on the other hand, he also gives much of his attention in 1624 to interests which have only a distinct relation to his central theme of human misery, its cause and cure. He adds extensively to his

collection of curious lore, and he spends more time in describing love and various forms of recreation with a detail and a zest betraying a personal interest distinct from his more or less scientific interest in these subjects as parts of his main topic. These peripheral interests compete with the central theme of the book for Burton's attention in 1624. In sum, these revisions and additions clearly prove what has been a growing conjecture on the part of my readers, that *The Anatomy of Melancholy* is far more than just an objective study of melancholy; it is Burton's expression of all his interests and beliefs — his personal pleasures as well as his inmost convictions.

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THE PROBLEM OF ARTISTIC CREATION IN ALPHONSE DAUDET'S WORKS

(Publication No. 3004)

Martin Alward Henry, Ph. D.
Princeton University, 1944

The general purpose of this study is an attempt to define the esthetic theories of Alphonse Daudet, and particularly to determine the results of these theories in his practice. In order to limit the field of investigation we have studied Daudet's prose works through the year 1874 by which date he was the master of his art.

Chapter I discusses the attitude of writers like Flaubert, the Goncourts, and Zola, who were Daudet's immediate predecessors or contemporaries, toward such conceptions as reality, taste, morality, truth, imagination and beauty. Following Flaubert's definition, we have termed the complete process of artistic re-creation *bien écrire*, and have divided that process into three successive and interrelated steps called *bien sentir*, *bien penser*, *bien dire*.

Chapter II is a step by step comparison of Daudet's esthetic theory with that of his fellow artists. Daudet shared with them a great sensitivity to the outside world, the custom of extensive observation and recording in *carnets*, the habit of selecting subjects which were modern and could be treated as frescoes of contemporary life. He experienced as they did a feeling of dualism and a dream-state during the preparation of a work. To a certain extent he conducted the same type of research, held their belief in the theory of *milieu*, encountered their problem of description, and accepted their solution. He shared their view that plot and characters must be devoid of distortion, shared their belief that there must be no "direct" intervention of the author's personality, and believed with them that art must be an interpretation rather than a reproduction. Indeed, in his insistence on "real" events, in his use of events and people only slightly removed from life, in his constant return to life for inspiration, in his hurried and intense transition from life

to art, Daudet showed himself almost "plus royaliste que le roi."

However, Daudet believed in two worlds, one external, general and observable, and one internal, individual and sensorial. To connect these two worlds was the duty of the artist. Daudet concluded a letter to Lepelletier with the significant statement: "Donc, mon cher Lepelletier, . . . il ne s'agit pas d'avoir vu, mais de faire voir."¹

Daudet believed that a person could not really comprehend, *voir* in the larger sense, an element of the external world unless he had felt, experienced, the counterpart of that element in his own individual world. Therefore, the author's first step in making a person *voir* was to increase the sensorial content of the subject.

Secondly, Daudet wanted to shorten the gap between the two worlds by endowing the element of observation with more life and by emphasizing its dramatic elements.

Chapter III, devoted to Daudet's process of *bien dire*, reveals his *point de départ* was the psychology of a character, with the body, the clothes, and the *milieu* serving as ever-widening rings in which the central psychological activity was being reflected or paralleled. Thus the clothes, the *milieu*, etc., became sorts of symbols or *motifs* to represent the psychological make-up of the character. We traced in detail one or two of these rather complicated series of symbols and *motifs*.

Since Daudet wished to place more emphasis on the sensorial, it was inevitable that he should make extensive use of sensations. He used them in many ways. For example, he might paint a scene in all one color, or perhaps in a series of modulations of color. He used sound with much skill, almost always investing it with a dynamic quality. Perhaps Daudet's most skillful work in the sensations was with motion. He was particularly skillful in the tempo which he achieved in his motion, the movement often starting almost imperceptibly to swell gradually to an almost uncontrollable climax. Daudet frequently combined motion with some other sensation, such as sound, or he sometimes wove several together, gathering them up at the end in a single word. Sometimes he presented one sensation in terms of another. Finally, Daudet often made the reader "see" a certain picture, by ending it with a sort of great chord representing several sensations and types of sensations, like the final notes of a musical crescendo.

1. Alphonse Daudet, *Oeuvres complètes illustrées* — Edition ne varietur, "Préfaces." Paris: Librairie de France, 1929-31. Vol. 12 p. 14.

Microfilm copy of complete manuscript of 263 pages, \$3.29. Enlargements 6" x 8", 10¢ per page.

**JEAN-BAPTISTE DE MIRABAUD (1675-1760)
HIS CONTRIBUTION TO THE DEISTIC
MOVEMENT AND HIS RELATION TO VOLTAIRE**

(Publication No. 2974)

Allen David Hole, Jr., Ph. D.
Princeton University, 1943

This study is not concerned with the Jean-Baptiste de Mirabaud already known to the students of the eighteenth century, one of the "Sept Sages" in Mme. de Tencin's salon, the translator of Tasso and Ariosto, the protégé of the house of Orléans, who from 1742 to 1755 presided as the perpetual secretary of the French Academy. Our interest has been in Mirabaud's association with the circle of free-thinkers around Boulainvilliers during the first twenty years of the century. We have studied the philosophical treatises he produced and compared them with certain other similar writings from the same general period. We have investigated, as an example of the scale of the influence on later writers traceable to these treatises, the relation between Mirabaud and Voltaire.

The list of ten treatises assigned by Professor Wade to Mirabaud, some of them tentatively, is first examined in order to decide more definitely which ones may be attributed to him. The method consists of compiling all the various links which may be established between the separate works, links many of which could not be conclusive if considered alone but which may be significant if supported by a number of other similar pieces of evidence. The links which have been discovered consist of statements by editors or manuscript copyists, references in one treatise to subject matter in another, statements in one that a certain subject has already been treated in another work, and striking similarities between two works, including sometimes actual parallel passages. Altogether more than thirty pieces of evidence have been found which indicate that the ten works on Professor Wade's list belong together. We have therefore a network of relationships so closely interwoven that a strong claim may be made for Mirabaud's authorship of all ten. As to the dates of composition, the evidence indicates that most of these were written in the decade from 1710 to 1720.

These ten works are next taken up one by one and a summary statement made of the subject matter contained in each, followed by the special relationship the given work has to other treatises of Mirabaud or to the writings of other authors. Striking similarities or actual parallel passages have been found not only between various of Mirabaud's treatises but also between Mirabaud and two clandestine manuscripts of the times, *Les Trois imposteurs* and *La Religion chrétienne analysée*; also between Mirabaud and the *Telliamed* of De Maillet, and both the *Histoire des oracles* and the *De l'origine des fables* of Fontenelle.

No satisfactory evidence has been found that Mirabaud had a measurable influence on Voltaire except that which arises from a comparative study of

the writings of the two men. An examination of the *Mélanges* volumes in the Moland edition of the *Dictionnaire philosophique* reveals some seventy cases where ideas expressed by Voltaire may be found also in Mirabaud. In no case, however, is the wording close enough to prove that Voltaire actually made use of Mirabaud and in addition many of the ideas are those which might be found also in other writers of the times. The problem is therefore attacked by relisting these seventy cases of similar ideas, involving one hundred and eleven actual pairs of page references, not according to the ideas expressed but according to the regular page by page order in each work of Mirabaud and of Voltaire. When this is done, a number of instances stand out where there are unusual concentrations of similarities. In three cases the concentration is so marked that one feels justified in concluding that Voltaire probably had the Mirabaud text at hand while writing. These three cases are the first five pages of the Dictionary article "Âme," three pages in the *Examen important de milord Bolingbroke*, and, most striking of all, the Dictionary article "Fin du monde." Parts of a number of other Voltaire works contain concentrations of similarities which seem significant although less spectacular.

In concluding, a statement is made of our present knowledge concerning Mirabaud's connection with the Boulainvilliers circle. A number of similarities to Bayle and Fontenelle have also been pointed out in order to make clear Mirabaud's position as one of the intermediaries between these men and the main deistic writers of the eighteenth century.

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RAMISTIC LOGIC IN MILTON'S PROSE WORKS

(Publication No. 2982)

Henry Franklin Irwin, Jr., Ph. D.
Princeton University, 1941

Abstract not available.

Microfilm copy of complete manuscript of 125 pages, \$1.56. Enlargements 6" x 8", 10¢ per page.

**FRENCH THOUGHT IN AMERICAN MAGAZINES:
1800-1848**

(Publication No. 3567)

Georges Jules Joyaux, Ph. D.
Michigan State College, 1951

This dissertation is an attempt to attain a global view of the impact of French culture on America, in the first half of the 19th century. The American magazines of this period — with the exclusion of specialized and scientific magazines — have been taken as representative of the thought of the age. On the whole, 558 magazines have been studied. From their contents 4462 items, referring to French ideas,

have been extracted and summarized, clear evidence of the great interest evinced by America in French culture.

Therefore, this study is, primarily, an annotated bibliography of these references to French culture found in general American magazines of the period 1800-1848. The second part of the problem, the analysis of the material collected, is beyond the scope of the present work, and has only been outlined in the first 100 pages of this study.

On the whole, I have limited my conclusions to general remarks concerning the most important aspect of Franco-American cultural relations in those 48 years. In the first chapter the general pattern of Franco-American relationship has been sketched in view of the political events involving the two nations. The second chapter, devoted to the reception of French fiction in America, points out America's reaction to the fancied "grossness" and "immorality" of French romantic novels. Relations of American transcendentalism and French Eclecticism are more particularly discussed in Chapter IV. The references gathered in this connection show the need for a more complete study of French contributions to American transcendentalism. It seems clear, from the evidence, that Victor Cousin played a very important role in making German philosophical thought known to American philosophers. Fourier's influence in America, the subject of the next chapter is shown to be far from negligible. His scheme of social reorganization was widely welcomed and adopted as a model for many communitarian experiments in America. Furthermore, Fourier was important in deepening American interest in social thought and also in opening new avenues of investigation to American social reformers.

Chapter VI shows the important role played by France as an intermediary between the culture of America and that of other countries. The last chapter deals with the impact of French science on American thought, since the more than 400 references to French science collected in the study made it advisable to devote a few pages to such a topic. This last chapter shows the high esteem in which French science was held in America and points out that it is particularly in this domain that French influence seems to have been the greatest.

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**BALZAC ET LE DETERMINISME
PSYCHO-PHYSIOLOGIQUE DE CABANIS**

(Publication No. 2988)

William Temple Ernest Kennett, Ph. D.
Princeton University, 1941

Abstract not available.

Microfilm copy of complete manuscript of 501 pages, \$6.26. Enlargements 6" x 8", 10¢ per page.

**EDITH WHARTON: CRITIC OF AMERICAN
LIFE AND LITERATURE**

(Publication No. 3602)

Nancy Rafetto Leach, Ph. D.
University of Pennsylvania, 1952

Edith Wharton was a more penetrating critic of American life and literature than most modern critics concede. In her discussion of American life, she was not only the outstanding social historian of her old New York, but she was also a critic of New England, and of the West and its impact on the East. In her discussion of these regions she reveals herself as essentially a critic of materialism and provincialism. Like the naturalists that she so disliked, she saw and hated the provincial timidity that was hampering the full growth of the United States, and the rampant materialism that was substituting its values for all other values in the hearts and minds of so many Americans. Most of her criticism was aimed at the provincialism of the old New York, the New York of her childhood, and the materialism of the new New York. In reality, her New Yorks are symbolic of America at large, which is borne out in her descriptions of New England and the West. It was the provincialism of New England and the materialism of the West that she ruthlessly satirized. To Edith Wharton, all of American life suffered from the limitations of its middle class, commercial origins.

Edith Wharton was not only a penetrating critic of American life, but she was also an important critic of American literature. Although she was ignorant of a large part of her own literature, and although she misjudged several of her compatriots, she was none the less important in revealing the changing currents in American literature during her lifetime. Her place in the history of American literature can best be understood if one thinks of her as a transition figure. She began writing when the lingering influence of the genteel tradition was still felt, when the new realists were gaining recognition, and the earliest naturalists were appearing on the literary scene. In her writing one sees elements of these three influences. While she rebelled against the moral timidity of the genteel tradition, against its sentimentalism and romanticism, she admired its love of the past, its respect for European standards in taste and culture. She approved of realism because it opposed the romantic and sentimental, broadened the material the novelist could deal with, extolled the individual to the type character and adopted the psychological approach to character and attempted, in general, to treat life truthfully. But she opposed the ultimate implications of realism since they opposed the foundations of her society. Realism extolled the common man and rebelled against privilege.

To the naturalists she was least indebted and least of all approving. She disapproved of their inclusiveness of detail, too frequently pornographic, their presentation of the abnormalities and crudities in American life, their disregard for morality, and their obsession with members of the lower classes. Naturalism was antagonistic to her fundamental beliefs

about fiction and life. None the less, from the naturalists she incorporated their scientific, detached attitude towards material, and their belief in determinism. In her relation to these three influences: the genteel tradition, realism, naturalism, Edith Wharton reflects her criticism of American literature.

Microfilm copy of complete manuscript of 348 pages, \$4.35. Enlargements 6" x 8", 10¢ per page.

BYRON'S CONCEPTS AND TREATMENT
OF NATURE: A STUDY IN CONTRADICTION
AND THE RECORD OF A FAILURE

(Publication No. 3001)

Ernest James Lovell, Jr., Ph.D.
Princeton University, 1946

This study of Byron's Concepts and Treatment of Nature is a descriptive analysis of the man Byron's reaction to the world of nature, of Byron the thinker's ideas upon the physical universe, and of the manner in which Byron the poet treated nature. It is thus concerned with at least three levels of thought, and aims at a degree of completeness. Three periods in the poet's life have been distinguished somewhat arbitrarily: the years before the important meeting and friendship with Shelley; the years following that meeting up through 1820, when Byron's reaction against the influence of Shelley had had time for full expression with the writing of Don Juan, I-V; and the years following 1820, which produced most of the plays. The study is not one of sources, although one of its results is to show how entirely foreign the influence of Shelley and Wordsworth was to Byron's more usual views and attitudes.

The first chapter opens with a consideration of the basic indecision, present in Byron's writing, before what remained for him always two distinct and opposite poles — Nature and Civilization — and goes on to examine his actual experiences of a life retired from the world. Of the two kinds of existence Byron was most genuinely sympathetic with that in the city. As a traveller, he reveals himself a rather typical picturesque tourist, viewing nature as if it were a picture, admiring the well-known examples of the picturesque and the sublime, comparing scene with scene, and classifying them according to type. The poetry of this period also reveals its affinity with the picturesque tradition. There is evidence, however, that in Byron was a longing for a more exalted experience with nature. The several passages indicative of it do not employ the idiom of Wordsworth, as do all the later instances. There is next examined a series of passages from Childe Harold and the oriental tales in which the idea is expressed or implied that "the beauties of nature . . . are lost" on the Byronic heroes. It is suggested that the presence of these passages is due to the fact that Byron himself sought in nature a significant and highly intense experience as an escape

from his peculiar, persistent awareness of self and his self-condemning thoughts; and not finding this attributed to his heroes an unawareness of nature or even a shuddering rejection of natural beauty. The final section of the chapter concerns itself with the contradictions inherent in Byron's deistic expressions and Calvinistic views, nature viewed both as a rational proof of Deity and design in the universe and as a creation harmful and dangerous to man, product of a capricious and unjust Creator distinct from his works.

The second chapter establishes the fact of Byron's inability to achieve repeatedly the romantic and mystical experience characterized by the loss of the sense of personal identity in a fusion of the individual with the great Whole, a universe which is pervaded by the essence of love. That inability is linked with his reaction against the influence of Shelley and Wordsworth and traced in part to his acute awareness of self, his strong strain of common sense, and his affinity with the mundane. The remainder of the chapter is concerned with a further explanation of Byron's failure to construct any system significantly relating nature and the spiritual development of man. Contributory reasons are discovered in the persisting attitudes of the tourist and the poet of the picturesque, and in the great emphasis Byron placed on accuracy and actuality in nature poetry, the latter two qualities strengthened by Byron's understanding of the ut pictura poesis doctrine and the Aristotelian mimesis. Two other important reasons for Byron's failure to erect a creed expounding a vital correspondence between man and nature are found in his continued awareness of a capricious and unjust Creator, God of a universe harmful and dangerous to man, and in his comic vision of nature.

The third chapter notices the decreasing number of expressions of the tourist's mind and of description in the picturesque tradition, and the increased interest in nature when it has literary or historical associations. Nature in this period often has the function of a temporary means of escape or relief from the cares of life. Despite the great decrease of nature poetry in the picturesque tradition, however, Byron continued in his poetic theory to take the position that poetry strives to produce the effects of painting. To this end he espoused two means: the depiction of a nature improved by means of heightening and selection, and nature accurately and factually described. The latter is found to be his most central position. And yet in spite of this respectable quantity of theorizing upon poetry descriptive of nature, he consistently depreciated it as a type, satirized most aspects of the return to nature movement, and denied in his life and writings "this cant about nature." His many deliberate refusals to describe were undoubtedly influenced by his realization of the increasing tourism of the day and the accompanying vulgarization of the picturesque tradition. Finally, his "skepticism" is examined and found to consist, not in the belief that knowledge of the physical universe and the relation of Deity to it cannot be known by man, but in Byron's failure, simply, to make up his mind upon these questions. His Calvinism,

reenforced by Cuvier, told him that mankind and his world were insignificant in a universe governed by a capricious Deity and helped him on to see that nature was often indifferent to man's spiritual aims or hostile to man. At the same time, however, he was able to link the beauty and order of nature with a benevolent Creator as effect and cause, proof of the existence of the cause, and as a source of deep religious emotion. God is not only "nature's architect" but also custodian of the laws of physics. Yet there was, in spite of these recorded views and beliefs, a generally decreasing interest in nature during these last years. Byron was turning more and more to an interest in man as a member of an organized society.

Microfilm copy of complete manuscript of 214 pages, \$2.68. Enlargements 6" x 8", 10¢ per page.

ANGLICANS AND NONCONFORMISTS, 1679-1704
A STUDY IN THE BACKGROUND OF SWIFT'S
A TALE OF A TUB

(Publication No. 3009)

John Ryerson Maybee, Ph. D.
Princeton University, 1942

Swift's vigorous satire against the Nonconformists in A Tale of a Tub raises the problem as to why such an attack was made in connection with the satire on the Catholics and with the ridicule of abuses in learning, and why the Dissenters were subject to this satire in 1704. One way of approaching this problem is through a study of the historical background. The two chief purposes of this study in the historical background are (1) in a review of the events of the period 1679-1704, to show the factual basis for Anglican antipathy to the Dissenters; and (2) by an examination of contemporary books and pamphlets, to show the resemblance of the Dissenters, as they were and as they were thought to be among Churchmen, to the allegorical figure Jack in A Tale of a Tub. The material examined in connection with this problem of background is also used to clarify the discernible unity in the Tale and to restate Swift's position in relation to movements of thought in the eighteenth century.

Whig policies and practices, as they may be seen in the Exclusion Bill of 1679-1681, the projected Association Bill of 1680, the acquittal of the Earl of Shaftesbury from the charge of treason in connection with the association project, and the Rye House Plot of 1682-1683 caused violent repercussion among the Tories. Many Tories and Churchmen picked on the Dissenters as the weak spot in the Whig armour, and directed their attacks specifically against them. In the Anglican pamphlets of the time it is possible to find widely current the conception of the Nonconformists as destructive, seditious fanatics, a conception not unlike Swift's in A Tale of a Tub. The salient features of Nonconformist thought and opinion for the whole period 1679-1704 may be seen in the controversial writings of the Dissenters through the years 1679-1685. These works reveal a hypercritical atti-

tude towards the Church of England, a hostility to any autocratic tendencies in ecclesiastical discipline and government, an inflexible desire to imitate every feature of the primitive Church, and a strong emphasis on the rights of the individual. One aspect of the individualism of the Nonconformists was their theory of the conscience, which, in its extreme form, implied a direct guidance of the individual by God. Theories of the conscience, combined with the use of informal prayer and the emotionalism of Dissenting worship, tended to foster this belief in immediate inspiration by God, a type of religious enthusiasm which was unconditionally asserted by the Quakers and vigorously opposed by Anglicans. There are many points of resemblance between the Dissenters, as they reveal themselves in their controversial works, and Swift's allegorical figure Jack in A Tale of a Tub.

The religious policy of James II in 1685-1686 was characterized by an extreme hostility to the Dissenters — a policy vigorously applied after Monmouth's rebellion. The failure of James to win English Churchmen over to his designs caused him to turn to the Nonconformists for support, and his solicitations for their aid reached a climax in the Declaration of Indulgence of 1687. Led by Halifax, English Churchmen set about weaning the Dissenters from the king, while many Nonconformists strenuously defended their support of James's unconstitutional toleration. The ruinous tendencies of James's policies, combined with the arguments of Churchmen and the advice of William of Orange's agents, did much to persuade Dissenters of the folly of a Catholic-Nonconformist alliance; and the success of the Revolution of 1688 was thus assured. The temporary rapport between the king and the Nonconformists caused much ill-feeling between Church and Dissent in the years to follow, and numerous traces of this ill-feeling may be found in A Tale of a Tub.

Attempts to bring the Dissenters into the Church of England early in the reign of William III provoked many Anglicans into attacking Nonconformist religious principles; and in these attacks the increasing belief that the Dissenters were destructive of all order and decency in religious matters is evident. This notion is even more apparent in the attacks of Scotch Episcopalians on the Scotch Presbyterians, in which the latter are represented as zealous fanatics, subject to all the extravagancies of religious enthusiasm. Towards the close of William's reign pamphleteering against the Dissenters was renewed in England; in this period the emotionalism of Nonconformist worship and tendencies towards enthusiasm, especially among the Quakers and other minor sects, are the most frequently recurring topics. The conception of the Dissenters developed in Anglican writings throughout William's reign closely resembles Jack in A Tale of a Tub.

The hostility of Churchmen towards Dissenters in the later years of William III was partly caused by occasional conformity, a Nonconformist practice used to obtain public office. In the campaign against occasional conformity, which came to a climax in 1703-1704 under Queen Anne, Anglicans and Tories stressed the various ways in which the temper of the

Nonconformists made them unsuitable for public life. Though the Occasional Conformity Bill became a political tool in the hands of the Tories, the arguments they put forward in favour of it were partly based on opinions of the Dissenters which were held by all Churchmen, including Swift. Thus while he even wrote against the Bill, he nevertheless published *A Tale of a Tub*, which reveals many features of the typical Anglican point of view of the time.

The close connection between Jack of the Tale and the Dissenters of 1679-1704 shows that Swift, in his satire, was not castigating a ghost resurrected from the distant past, but was dealing with matters of great concern to his own contemporaries. The historical background of the *Tale* which reveals this connection also helps to clarify the relationship of the allegory and the digressions in *A Tale of a Tub*, since many of the alleged errors of the Nonconformists are very similar to the aberrations in modern learning which Swift ridicules in the digressions. The pattern of Nonconformist thought was in several ways a model for romanticism, and Swift, in opposing these aspects of Nonconformity, was writing against many potential, as well as some obsolescent, threats to the order of English social and intellectual life.

Microfilm copy of complete manuscript of 444 pages, \$5.55. Enlargements 6" x 8", 10¢ per page.

SIR KENELM DIGBY
"THE ORNAMENT OF ENGLAND"

(Publication No. 3020)

Robert Torsten Petersson, Ph. D.
Princeton University, 1946

Sir Kenelm Digby (1603-1665) was an epitome of seventeenth-century England. The purpose of this dissertation is to offer, for the service of scholars and readers of that age, as accurate a conception as possible of a man frequently met with in their reading. To this end all available material has been collected with the intention of studying the personality of one who, though participating in all fields of endeavor, gained prominence in none. The treatise is in five chapters, of which one is general and four are specialized studies of the major phases of Digby's intellectual life: his science, philosophy, religion, and arts and letters.

The first chapter is a selective and corrective biography designed to contain in its body or in its notes all the biographical material procurable. A full statement of the biographical facts would only duplicate what others have printed. Since every treatment of Digby has been incomplete, and since Digby, as a versatile and romantic figure, has lured many essayists into popularizing or initiating much biographical error, the object has been to settle the contradictions of the biography and to present the virtually unknown parts of it. The personal qualities which become conspicuous are his passion for activity, his limitless interest, his great sense of charity, his liberalism, his humor and his even more

fundamental melancholy. The characteristic most outstanding in him is his largeness — largeness of physique and spirit and intellect. The points of biographical dispute include his birth date, his early education, and his temporary conversion to the Anglican Church.

The second chapter discusses Digby's principal pursuit in the practical world, his science. The special aspects of his scientific life, which together supply a total conception of his scientific experience, include his connection with the Royal Society, his experiences in pseudo-science, cookery, botany and medicine. Digby's famous discourse *Of the Sympathetick Powder* is analyzed in detail against the background history of the sympathetic cure from Pliny to the present. Also are described Digby's conceptions of Harvey's theory of circulation (in which he correctly opposed Descartes), of embryology and, most significantly, of the necessity of oxygen to vegetable growth. Finally Digby's scientific reputation is described and his friends are mentioned, including Galileo, Harvey, Boyle, Mersenne, Fermat, and members of the Royal Society. In science Digby was an intelligent amateur, more popularizer than man of science.

Philosophy is the subject of the third chapter which focuses on Digby's magnum opus, the joint treatises *Of Bodies* and *Of Man's Soul*, which define his views of the physical world and the spiritual. Essentially an atomist in physical philosophy, he writes with a metaphysical purpose. His thesis is that the irrelevance of physical laws to the spiritual world proves the soul's immortality. Among the judgments of Digby's philosophy are the atomistic criticism of Kurd von Lasswitz and the epistemological criticism of Ernst Cassirer, neither of which has before been considered by Digby scholars. An attempt is made to place Digby in the history of philosophy and to study the sources of his thought. It was found that Aristotle had the largest influence on Digby's physics; that Galileo's and Descartes' were considerable; that Bacon, unexpectedly, was not an authority actually acknowledged by Digby; and that the second treatise is generally the more original. A description of Digby's relationship to Hobbes and Descartes closes the chapter.

The fourth chapter on religion is largely an analysis of Digby's extensive religious writings, with particular emphasis on his *Observations upon Religio Medici*. This work is minutely discussed, as are the circumstances of its writing and the comparison of Digby with Sir Thomas Browne. The nature of Digby's Catholic and liberal attitude is naturally stressed in each of his writings. Universal love is the theme of his religion. This great bulk of writing is placed in the context of his religious biography, chiefly his banishments, his papal missions, and his transactions with Cromwell.

The Final chapter gives a full account of Sir Kenelm's artistic activities in architecture, antiquities, painting, book binding, book collecting, and most of all, in writing. Digby was not primarily a creator but a critic and patron. His literary friends are mentioned, including Howell, Jonson, Selden, Evelyn, Falkland, and Denham. His work in translation,

editing (mainly the 1640 edition of Jonson's works) and criticism is described. His criticism of a stanza from the *Faery Queen* is given attention along with his criticism of George Hakewill, John Fuller and St. Augustine. The chapter and the thesis conclude with an appraisal of Digby as a literary artist, with illustrations from the genuinely literary passages in his private letters, poetry, memoirs and the conclusion to *Of Man's Soul*, which is the keynote of his art and his life. Digby's personal approach to every subject is the unifying element which this study tries to express.

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THE STANZA OF THE FAERIE QUEENE

(Publication No. 3025)

Frederic Eugene Reeve, Jr., Ph. D.
Princeton University, 1942

The nine line stanza which Spenser evolved as the prosodic vehicle for his greatest poem has had as many critics as it has had imitators. Neither the praise nor the blame it has received for so many years has contributed much to an understanding of the form, nor the reasons for Spenser's development of it for a narrative poem. It is my contention that this failure to evaluate the unique form of the stanza and its virtues and defects as the embellishment of the *Faerie Queene*, is the result of failing to examine the stanza, either in the light of some carefully developed theory of prosodic analysis or in the light of a thorough examination of the poem itself. Because the long narrative poem as conceived by Spenser is characterized by enormous variety of episode, action, character, and scene, and is based structurally upon the classical epic and the medieval romance, in its composition the poet was faced with the desire to delight through variety and the necessity of writing a narrative which moved constantly forward. The nine line stanza had to be at once a unit of perception, the proper vehicle for the many descriptions, scenes, speeches and moral dicta, and yet the same time fluid and progressive in construction.

There are many theories of prosody, and there are many analyses of the *Faerie Queene*, but they rarely occur in combination. In this thesis, therefore, it has been my attempt to discover the prosodic construction of the stanza, to examine its unique attributes, and to demonstrate its appropriateness to the *Faerie Queene*. Three stages are necessary to this demonstration: first, the development of a theory of prosodic analysis; second, the application of that theory to the stanza; and third, a summary analysis of the poem to determine its characteristics. The conclusion is a suggestive essay relating the prosodic structure, which has been considered in isolation only for the sake of convenience, to the poem itself.

The theory of prosody developed in the first chap-

ter of the thesis is based upon the work of many prosodists, particularly Mr. Elder Olson's unpublished University of Chicago thesis, *General Prosody*. The study of prosody is an examination and enumeration of the modes by which a poet combines speech sounds for the embellishment and enhancement of his diction. The prosodic structure is divided into three parts, *rhythmic, metric, and harmonic*. The rhythm of verse is considered as a temporal phenomenon, a proportion between the time it takes to utter speech sounds or syllables. The grouping of speech sounds into perceptible temporal proportions known as feet is said to be effected chiefly by accent, and secondarily by pitch, similar sound, and grammatical position. Metric is the grouping of rhythmic feet into recognizable sections, known as lines and stanzas, by rhyme, by pitch, by cadence, and by grammatical structure. Harmonic is the study of sounds as similar or dissimilar arranged to achieve the effect of fluency or haltingness, and the patterning of these sounds into more or less closely perceived figurations.

The prosodic analysis of the stanza is almost entirely inductive, based primarily upon the examination of numerous representative stanzas, and incidentally upon historical background and Elizabethan theories of diction and prosody.

The significance of the rhythm of the stanza lies in its apparently inflexible syllabic construction which, contrary to the usual supposition, is a carefully calculated temporal relation of these syllables. Its great flexibility derives from the skillful use of pause (there are many fewer than the punctuation leads us to believe), from the juxtaposition of feet of varying constitution, and from the equalizing of lines of different length. Particularly the rhythm is the rhythm of whole stanzas, of groups of lines not of single lines, and this is achieved through a number of rhythmic tensions, of foot to foot, line to line, which are resolved in the final cadence of the Alexandrine.

The metrical analysis of the stanza considers the prosodic function of such factors as the rhyme scheme, the cadences, the grouping of lines by pitch, the metrical rise and fall, and the function of the Alexandrine. The construction of the stanza, grammatically and prosodically, is found to resemble that of the Italianate sonnet. The usual stanza is a group of four lines against five, or five against four, with a double cadence, the whole tightly connected by interlocking rhyme and by grammatical construction. The metre is found to assist the poet in achieving a closely woven stanza unit which is at the same time organically progressive. Further, the stanzas are related to one another by the essential similarity of their metrical construction, and by certain specific devices such as echoing rhymes, refrains, cognate syllables, relative pronouns and close binding conjunctions, and by words directly relating to what has been said in previous stanzas.

In the stanzas analyzed for their harmonic construction, we observe a constant attempt upon Spenser's part to unify the groups of lines by the use of syllables which are related by similarity of sound (assonance, consonance, and alliteration), and to arrange his syllables in order to bring together closely

related sounds and easily pronounced consonantal combinations to create a polysyllabic fluency. In addition to the structural function of the sounds so arranged, they seem to have been chosen for their euphonious and pleasing quality and for their associative effect, in order to lure the reader into the impression of onomatopoeic verse, and to capitalize upon the "musical" quality of their patterning. It is this combination of fluency with similarity that distinguishes Spenser's harmonic figurations from those of other poets.

The summary discussion of the form of the *Faerie Queene*, which is the third section of the thesis, is included in order that the reader will have at hand some consideration of the kind of poem which the prosodic structure embellishes. The poem is considered in the light of Aristotle's discussion of epic poetry and Spenser's explanatory letter to Raleigh with particular reference to the narrative technique of the poet.

The appropriateness of the stanza has been considered on the basis of three questions. Why a stanza? Why a nine line stanza? What are the advantages of prosody in general and Spenser's prosody in particular. In this chapter I have discussed the nature of the diction to which the prosodic structure is subservient, the role of the stanza as a unit of perception to enforce the attention of the reader upon various aspects of the narrative, the desirability of its length as an expansive frame to carry the weight and power of the poet's words, the "music" of the poem, and the contrast of Spenser's stanzas with those of Thomson, Burns, Byron, Shelley and Keats to demonstrate the several ways in which Spenserian may differ from one another and yet be called the same prosodic form. Throughout the thesis I have chosen examples which illustrate the variety of stanza construction, and have selected certain stanzas to illustrate the defects of the prosodic structure.

The chief defect of the stanza form is its over-elaborate composition which calls attention to the sound rather than the meaning of words. The two greatest virtues of the prosodic structure are its efficiency in unifying the nine lines of which it is composed and its arrangement to keep those lines in motion. The stanza, moreover, is a form most unlike prose, most capable of enlarging upon the effects which verse may properly possess, and in this respect it is most appropriate to the *Faerie Queene*.

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UT MUSICA POESIS
THE PARALLEL OF MUSIC AND POETRY
IN EIGHTEENTH CENTURY CRITICISM

(Publication No. 3034)

Brewster Rogerson, Ph. D.
Princeton University, 1946

The French critics of the *grand siècle*, driving toward the perfect unification of all their knowledge about the arts, gave the first impulse in modern times to a sort of comparative aesthetics, a systematic inquiry into the affinities between one art and another. The eighteenth-century "parallel" of music and poetry was one of the products of that drive for system.

The writers who were interested in the parallel used it largely as a frame for their philosophic commitments. In their essays and books they discussed the connateness of music and poetry in the first days of mankind, the sympathetic harmony that bound together the realms of art and morals, and the natural eloquence of the two arts of song.

About those matters they were able to agree. The source of controversy in their work was the ancient problem of imitation. According to the French rationalists, music and poetry were both imitative arts; all arts, they said, copied the passions or actions of men. But the British essayists could not accept a doctrine of *mimesis* for music. Their solution was to speak of the "expressiveness" of music, an immediate and somewhat mysterious power that swayed the passions without imitating anything at all. As the anti-mimetic theory gained support in England and Scotland the conceptions of sympathy and genius allied themselves with it. Gradually, the emphasis of criticism shifted from the intellectual unity of the seventeenth-century rationalists to the unity of emotional conviction that underlay the poetics of Wordsworth and Shelley. The doctrine of expressiveness, as it appeared in the work of the parallelists, led directly to the re-synthesis of critical theory in the first years of the nineteenth century.

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THE DEVELOPMENT OF HISTORICAL CRITICISM
IN ENGLAND 1532-1700

(Publication No. 3037)

Urban Joseph Peters Rushton, Ph. D.
Princeton University, 1940

Abstract not available.

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MELVILLE'S ORIGINALITY: A STUDY OF SOME OF THE SOURCES OF MOBY-DICK

(Publication No. 3040)

Wilbur Stewart Scott, Jr., Ph. D.
Princeton University, 1943

The numerous allusions, references, and quotations in Melville's great novel, *Moby-Dick*, constitute an invitation for the scholar to discover how much of the author's reading went into the creation of the novel. A grouping of the works which Melville mentions, quotes from, or refers to by author, would include travel, zoological, literary, geological, legal, phrenological, historical, navigational, theological, and whaling books. Because these sources present too wide a scope for a thesis, it is with the last group that this study is concerned, and for further limitation, with only those whaling books (with a single exception) which Melville specifically mentions.

These books have been treated, for the most part, according to the order which Melville gives them in his chapter "Cetology" (XXXII). "Many are the men," says Melville, "... who have at large or in little written of the whale." Then he produces a bibliography which reads, when he comes to the whaling portion: "Scoresby; Beale; Bennett, J. Ross Browne; the Author of *Miriam Coffin*; *Olmstead*; and the Rev. T. Cheever." Each of the first four of these is considered in a separate chapter. The last three being of lesser influence, are considered in a single chapter. The sixth and last chapter embraces the minor sources, divided into genres: *Ribs and Trucks* (essay); *The History of Nantucket* (history); *Tales of a Voyager*, *Mocha Dick*, *Wharton the Whale-Killer* and *A Cruise in a Whale-Boat* (fiction); *The Shipwreck of the Essex*, by Owen Chase, *A Narrative of the Mutiny on Board the Ship Globe*, and *The Life of Samuel Comstock, the Terrible Whaleman* (factual narrative); and "Currents and Whaling," and *A Voyage to the Atlantic and Round Cape Horn* (travel).

So much for the material and order of the study. The treatment is based on the conviction that source studies achieve a real value only if the investigator can demonstrate the creative method that lies behind an author's use of sources. Therefore, the thesis attempts to discuss critically not only the similarities between *Moby-Dick* and its sources — and there are many of them — but the differences as well; to show how and why Melville changed the material before him.

As for the results, they show first, that Melville depended very considerably on whaling literature for his material, even to the extent that he used sources to confirm or supplement information that as a whaleman, he must surely have known through experience. Second, that almost invariably he changed his material, by introducing images; by elaborating them if his source contained images; by writing facetiously where his source was sober; by writing soberly where his source attempted humor; by condensing, and by expanding. His large purposes behind such changes are three: naturally high spirits

often moved him to humorous expansion; his poetic talent enabled him to convert factual statement into passages of artistic beauty; and his philosophical conception behind the novel, the allegorical significance and the entire world of the voyage of the *Pequod* caused him to refashion his material so that it might have the manifold meanings he wished it to have.

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SHAKESPEARE'S PART IN PERICLES

(Publication No. 2694)

Grace Elizabeth Seiler, Ph. D.
University of Missouri, 1951

Pericles, Prince of Tyre dramatizes the ancient legend of Apollonius of Tyre. Its chief source is John Gower's version as given in Book VIII of the *Confessio Amantis*. However, Lawrence Twine's translation of the *Gesta Romanorum* version has been used also.

Scholars generally agree that *Pericles* is the work of two writers, that one of these writers is Shakespeare, and also that Shakespeare's hand is most evident in the last three acts of the play.

I have tried to determine Shakespeare's part in *Pericles*. I have done this by comparing and contrasting *Pericles* in incident and in characterization with its principal sources, by pointing out passages that are written in Shakespeare's late manner, and by studying the misprintings in the first printed text of *Pericles* in the first quarto, Q₁.

I have worked on the hypothesis that *Pericles* is a revised play and that the original play, now lost, was produced on the London stage before Shakespeare made his revisions. The popularity of this play called forth a reprinting of Twine's narrative and also a brief novel which professes to tell the true story of the play. This novel, *The Painfull Adventures of Pericles, Prince of Tyre*, was written by George Wilkins, who supplemented his story by Twine, sometimes copying verbatim whole sections from the translation. A study of Wilkins's novel seems to show that it was based on notes which Wilkins made at a theatrical production of the original play which Shakespeare later revised. Sometimes these notes were sketchy and Wilkins was obliged to use Twine in order to complete his story.

By comparing *Pericles* with Wilkins's novel, as well as with the versions of Gower and Twine, it is possible to gain a fair idea of the old lost play and also of the revisions which Shakespeare must have made in that play.

Furthermore, the irregularities in the printing of the first quarto of *Pericles* seem to indicate revision also. These misprintings include prose printed as verse, verse printed as prose, and also verse which is wrongly divided. The misprintings are scattered and brief in the first two acts, indicating that they were probably written in the margins of the old play. They are longer and more numerous in Acts III - V.

In Act IV, especially, it is noticeable that great blocks of verse have been printed in prose. As many of the revisional passages are too long to be marginal revisions, we must conclude that they were written as unlined blank verse and on separate pieces of paper. We must conclude also that Shakespeare sometimes worked quite hastily, expecting of course that his work would be copied correctly and clearly by a competent scribe. This probably was done, but if so the clean copy was lost, for what we have in the first quarto looks as if it had been printed from Shakespeare's revisions of the old playhouse text.

However, Shakespeare probably wrote some of his poetry correctly aligned as blank verse. I have indicated these passages by showing that they have stylistic characteristics of Shakespeare's later poetry.

My thesis seems to give evidence that Shakespeare's part in *Pericles* is greater than has generally been supposed. It shows that Shakespeare's revision begins with the first speech of Pericles and that it continues through the last scene in Act V. It confirms an earlier belief that revision was greater in the latter parts of the play. It shows also that Shakespeare's purpose was to refine the old Apollonius story, to make more admirable the chief characters, particularly those of Pericles and Lysimachus, and to increase the dramatic effectiveness of the play.

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THE MEXICAN CORRIDO AS A SOURCE
FOR INTERPRETIVE STUDY OF MODERN
MEXICO (1870-1950): WITH A CONSIDERATION
OF THE ORIGINS AND DEVELOPMENT
OF THE CORRIDO TRADITION

(Publication No. 3591)

Merle Edwin Simmons, Ph. D.
University of Michigan, 1952

The purpose of this study is to establish the value of the Mexican *corridos* (ballads of the common people) as a source for interpreting modern Mexican life. An effort is also made to trace the *corrido's* development from its early origins down to the present time.

Chapter I traces the *corrido's* development from its Spanish origins through its evolution into a significant expression of popular attitudes in Mexico. The beginning of the *corrido's* period of greatest popularity and significance is found to date from about 1870. Literary aspects of the *genre* as well as its general role in Mexican life are also studied in this chapter.

Chapter II treats with continuing development of the *corrido* during the years between 1870 and the beginning of Mexico's social revolution in 1910. The diverse types of *corridos* which the period produced are classified according to the following literary

themes: violence, catastrophe, bandits and *caudillos*, military matters, bull-fighters, matters of general public interest, and miscellaneous categories of which six sub-groups are made. The pre-revolutionary period as a whole is viewed as one during which the *corrido* was preparing itself for the very important role which it was destined to play after 1910 as a popular chronicle of a nation in revolution.

The main body of the study treats three most important aspects of the Mexican Revolution (1910-1950) which lend themselves to study through the *corrido*. personalities of public figures, revolutionary ideology, and Mexico's relations with foreigners. Documentation of popular attitudes toward these topics is provided by strophes extracted from a large collection of *corridos*.

Chapter III, in studying revolutionary personalities, treats in detail presidents Porfirio Díaz, Francisco I. Madero, Victoriano Huerta, and Lázaro Cárdenas, while other presidents receive passing attention. A second section of this chapter deals with revolutionary *caudillos*, from among whom Pancho Villa and Emiliano Zapata are chosen for detailed study. Lesser figures are given more perfunctory treatment.

Three aspects of revolutionary ideology — Political reform, agrarian reform, and religious reform — receive careful study in Chapter IV. Other reforms receive less thorough treatment.

In Chapter V Mexico's relationship to the United States and North Americans is selected for detailed study as the most important of Mexico's foreign relations. Mexican attitudes toward other foreigners are given passing attention.

From this study significant conclusions are drawn regarding: (1) the *corrido* itself; (2) modern Mexico as viewed through the *corrido*. Concerning the former, the dissertation establishes that the *corrido*, when properly interpreted, is a significant source for study of modern Mexico. Regarding modern Mexico, significant facts emerge concerning the *pueblo's* support or rejection of public figures; its acceptance or rejection of significant phases of revolutionary ideology; and its attitudes toward the Revolution, revolutionary governments, and government in general. Mexican animosities toward the United States and North Americans are clearly revealed, as is also the change in feeling during the recent period of improved Mexican-North American relations.

In all chapters diverse but significant aspects of Mexican popular psychology receive attention.

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SAMUEL SEWALL: THE MAN AND HIS WORK
(Publication No. 3572)

Theodore Benson Strandness, Ph. D.
Michigan State College, 1951

Few men, and certainly none in his generation in America, have left so extensive, so detailed and interesting a record of the world they knew and the life

they lived as did Samuel Sewall (1652-1730). This record, and pre-eminently, of course, the diary, has long been recognized as an invaluable contribution to our knowledge of Puritan New England of the late seventeenth and early eighteenth centuries. As such, it has been used as a source of materials about every conceivable aspect of the New England of his day, religious, political, social, aesthetic, economic, and moral. It has been used, indeed, to provide everything except a detailed picture of Samuel Sewall himself. To provide such a picture is the primary object of this study.

The organization of the study is, for the most part, topical. Chapter I deals with the English background, Sewall's arrival as a child in Massachusetts, his boyhood years at Newbury, and his training for Harvard. Chapter II describes his education at Harvard, shows the overwhelmingly theological influence of his training on his later intellectual life, and traces his association with the college during many years as a member of its Board of Overseers. Chapter III treats of his marriage to the daughter of the wealthy Boston merchant, John Hull, his abandonment of plans for the ministry to pursue a career in business, and his accomplishments in this new calling. It traces the changes that were coming to New England as property and merchandize began to assume prominence over the spiritual interest in the colony and shows how these changes were reflected in Sewall's property-centered attitude and actions at the time of the loss of the Colony Charter. While demonstrating this, however, it undertakes to make just as plain that the picture given by Professor Partridge of Sewall as a Puritan embodiment of Defoe's merchant ideal is highly erroneous. Contrary to this interpretation, it shows that Sewall was not conspicuously successful either in his mercantile undertakings or in the management of his wife's property, that his career as a merchant was short-lived, and that his energies during the greater part of his life were primarily given to meeting the demands of various public offices. Chapter IV presents this career as a public servant, describing Sewall's service in such various offices as Boston Constable, deputy in the General Court, member of the Court of Assistants while Massachusetts was yet a colony and of the Council when it became a royal province, member of the Court of Oyer and Terminer established during the Salem Witchcraft, judge of the Superior Court of the province, justice of the peace, judge of probate for Suffolk County, captain of one of Boston's train bands and of the Ancient and Honorable Artillery Company, and holder of such town offices as Overseer of the Poor, Moderator of the Boston Town Meeting, and School Inspector. The chapter shows how through half a century of public life he pursued a course marked by a conservative regard for things as they had been in the first years of the settlement and how, also, his conservatism was qualified by an unusually liberal attitude on certain issues, most notably such as concerned the colony's policy toward the Indian and the Negro. Chapter V treats of his work as a writer. It analyzes his accomplishments as a diarist and describes his work

as a writer of humanitarian and prophetic subjects and as a poet. It indicates that, like the purely prophetic writings, his verses possess mainly a curious and historical interest, but that his writings on the Negro and the Indian contain certain memorable utterances and voice an attitude far in advance of his generation. In them we are introduced to the problem of minority groups in the Puritan community and to the questions of liberty and equality in Puritan political theory, the significance of which found illustration in the later revolutionary movement in New England. Chapter VI deals with his private life and last years. The nature of the Sewall household, Sewall's relations with his wife and children, his religious life, his recreations, the courtships of his later years, his retirement from the public scene, and, finally, his death — all are described. Chapter VII is in the nature of a conclusion, briefly presenting an estimate of the man and his work and tracing the changes which Sewall's reputation has undergone through two centuries.

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HERMAN MELVILLE'S CONCEPTION OF THE GREAT WRITER AND HIS EXPERIMENTS IN LITERARY MANNERS

(Publication No. 3658)

Margaret Susan Sweetser, Ph. D.
University of Minnesota, 1952

In *Typee* (1846) and *Omoo* (1847) Melville is not yet a mature craftsman, but merely conforms to the pattern of the travel tale with its emphasis on romantic fact and its liability to digressive interruption. To tighten his narrative, however, and to give a semblance of veracity to his use of fact, Melville develops expository techniques which, with his habit of self-explanation, persist into his mature work.

In *Mardi* (1849) Melville abandons mere reporting and attempts an investigation of the dualisms or "truth" of human experience — a premature investigation, but one which encourages him to examine the specific evil which the quest for truth has disclosed. Hence Melville becomes the social critic — a role which involves a selective use of brutal fact and the development of a pattern of moralistic (in *Redburn*, 1849) and argumentative (in *White-Jacket*, 1850) commentary. This moralizing, arguing, and dramatic use of fact likewise persists into Melville's later work.

As Melville's objective becomes more complex, he develops a new self-consciousness about his function as writer. The world, America in particular, he finds unsympathetic to the great writer whom, in the romantic tradition, he conceives as the universally representative poet-priest. This romantic pattern he nevertheless modifies in terms of his own experience in a manner best termed "heroic." Notably heroic is his insistence that the great writer be the exuberant spokesman of his own culture. Not a codifier, Melville is for the most part content to generalize about the

method of the writer — recommending originality of theme and idealization of materials. He is specific only in outlawing the sentimentality and clumsy realism that he sees emerging in popular fiction.

In practise if not in theory, Melville gradually evolves a manner, compounded of traditional manners, appropriate to his writer. Allegory is fundamental, although it tends to disintegrate into parable and shifting symbolism. In *Mardi*, for instance, the allegorical sea-quest of Taji becomes a mere frame surrounding a tissue of parables illustrating the reality of evil. In *Moby Dick* (1851) the sea-quest of Ishmael is a mere frame surrounding the parable of an Ahab who, recognizing evil, denies good. *Pierre* (1852), complicated by Melville's experimenting with a land and society novel locale, is a parable with the allegorical frame omitted — the parable of a man who, recognizing evil, attempts to convert it to good. The three parable-allegories reveal Melville's increasing pessimism and his conclusion that in this world men had best set aside chronometrical (heavenly) ideals and make horological (worldly) compromises.

Melville's late parable-allegory goes a step further, localizing evil in those compromises necessitated by a mechanistic, horological society. A first division comprises the parabolical sketches in which Melville examines the machine culture itself and the lot of the disillusioned idealist. A second division continues the large-scale duel of good and evil against the familiar sea background — *Israel Potter* (1856) with its exhausted symbolism; *The Encantadas* (1856), an exploration of a horror land comparable to the horror sea of *Moby Dick*; *Benito Cereno* (1856), parabolical illustration of the manner in which civilization so adulterates good that it becomes a prey to evil. The same postulate underlies *The Confidence-Man* (1857), a series of parabolical encounters in which evil outwits good before the eyes of the misanthrope and the Ishmaelitish, potentially misanthropic Cosmopolitan. *Billy Budd* (1924), of thirty years later, constitutes a resigned parabolical extension, for the benefit of the Ishmaelitish Captain Vere, of the conclusion arrived at in *Pierre* — the new conclusion that, whether he makes the horological compromise or not, the idealist is doomed.

To supplement his allegory, Melville makes use of other literary manners, the earliest and most persistent being what he terms the "epic." This epic manner involves the use of fact as ballast, an obscure and connotative allusiveness, and an exhilarated and derivative rhetoric. His second supplementary manner, the dramatic (incipient in *Mardi*, pervasive in *Moby Dick*, and disastrously intrusive in *Pierre*), involves a generally dramatic movement in the narrative, the use of tableaux and stage effects, of choric minor figures, and of lofty, stage language. His final manner, the analytical, is an outgrowth of the dramatic mode; an attempt to show the human mind struggling with problems of good and evil, it brings an intolerable complexity and subtlety of language.

Melville's attempt to evolve an heroic manner appropriate to the heroic writer is never completely

successful, but, as he himself contends, the relative failure of that attempt is the best proof of its being heroic.

Microfilm copy of complete manuscript of 322 pages, \$4.03. Enlargements 6" x 8", 10¢ per page.

LYTTON AS A LITERARY CRITIC

(Publication No. 3050)

William Howard Taft, III, Ph. D.
Princeton University, 1942

This dissertation upon Edward Bulwer, Lord Lytton, as literary critic is a survey and elucidation of his literary criticism and an estimate of its quality. By examining his scattered comments upon literature as they are found in numerous magazine articles, essays, letters, prefaces, novels, and miscellanies, I have been able to demonstrate the remarkable consistency of his criticism. Even though it suffers from a lack of originality, a condition common to most critics of his generation, his wide range of interests and extensive reading did not fail to make valuable contributions to literature. Some few of his ideas are suggestive and deserve greater consideration than have been given to them.

Chapter One, 'The Education of a Critic,' discusses Bulwer's youth, his character, early activities and associations, all of which affect his subsequent criticism to an important degree. A lonely childhood accentuated his inherent shyness, stimulating his reading so that his reflections upon literature developed early; his opinions changed but little in later life. Early interest in history gave him a comprehensive point of view. Debating at Cambridge foreshadowed both his political career and his study of oratory, which in their turn permitted him to influence English literature by legislative action and to discuss the relations between oratory and other literary arts. A Continental tour initiated his interest in German writers. Abuse from critics of his early novels so warped his opinion of periodical criticism that he later found it difficult to heed good criticism of his writing. Beyond this, an acquaintance with William Godwin influenced both his literary philosophy and the content of his own novels. The Chapter concludes with a survey of *Conversations with an Ambitious Student*, one of his earliest critical pieces and an example of his method.

Chapter Two reviews his criticism as it was expressed in his journalistic and political activity of the decade of the 1830's. Reform in literature, especially in the field of the drama, is the keynote. Bulwer employed *The New Monthly* and wrote *England and the English* to demand the cessation of anonymity in reviewing and removal of taxes upon knowledge; and he used his Parliamentary position to promote dramatic copyright and to insist upon the abolition of the London theatrical monopolies. He sought also to improve the drama by criticism, insisting that it must forsake the influence of the Elizabethans and appeal to the popular emotions. He defined the true critic and

discussed the novel as the successor of the drama and as a moral force. He complained that the new poets, including Tennyson, lacked originality. He encouraged Leigh Hunt and Laman Blanchard whose merits, in his opinion, demanded greater appreciation. Bulwer realized by this time that literature was facing new problems and struggling in a new environment. His critical activity was calculated to promote new directions in literature and to stimulate taste (His translations of Schiller are an example). To sum up, he revealed himself as a keen observer and as a critic capable of analyzing the current problems of literature.

Chapter Three discusses Bulwer's criticism of the novel. More than any other nineteenth century writer, with the possible exception of Scott, he made writers aware of the possibilities of the novel, always insisting that it should be regarded as an artistic unit. Ever since his Mother had criticized the moral of his first novel, *Falkland*, he emphasized the need of moral purpose in the novel. From Godwin he adopted the idea of judging novels by their tendency. The numerous prefaces to his own novels prove him to be aware of the problem. Further, they show him eager to experiment, to extend the range of the novel, and at the same time to hold it within artistic limits. Magazine articles reveal in him continued insistence upon the novel as an art form, a certain prudishness, a hesitant praise of Scott because that novelist lacked the elements of 'conception' and dramatic presentation, an approval of Fielding as moralist and planner. In frequent commentary upon the novel he also advances and strengthens his views of other literary genres and of aesthetics.

Chapter Four considers Bulwer's more formal essays, in which his profounder critical ideas are developed and incorporated. They clearly demonstrate the consistency of his thinking, many of them being concerned principally with a discussion of style and all of them emphasizing the morality of art. In an essay on Thomas Browne he is almost the first to appreciate in print the gorgeousness of that writer's prose, taking issue with Dr. Johnson. Goldsmith and Gray are analyzed as stylists. The *Caxtoniana* essays demonstrate Bulwer's range of interests and confirm his preoccupation with art as a moral force and with style. Other related subjects included are oratory, sympathy, shyness, and knowledge of the world, and it is easy to demonstrate the relations between them. His development of a few general ideas only and his refusal to branch out into new fields is apparent. His consistency is proved.

Chapter Five concludes the thesis with a discussion of Bulwer's attitude towards his contemporaries and the Latin and Greek literatures. His later criticism becomes too general to be productive of ideas. Excepting comment on Lamb, Hunt, Hazlitt, and Coleridge he has little to say concerning nineteenth century writers. When his opinions of contemporaries are made known, they prove to be conventional and inadequate. Like other critics of his generation he is frequently unstimulating and superficial, and slow to appreciate several of the

better nineteenth century poets. In fact, his later criticism lacks the enthusiasm of appreciation, and he is content to treat subjects which have been too long in his repository of criticism. His more valuable contributions to literature were his practical activities and efforts to improve the state of periodical criticism, the drama, and the novel.

Included in an Appendix is a list of Bulwer's writings which may be classified as literary criticism.

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ENGLISH POETIC THEORY 1825-1865

(Publication No. 3062)

Alba Houghton Warren, Jr., Ph.D.
Princeton University, 1941

The following thesis is an experiment in the historical approach to the theory of poetry in the nineteenth century. I have limited the specific field of my investigation to the period between 1825 and 1865 in England because in the search for a method of handling it seemed advisable to begin with comparatively simple materials, and the fields of romantic and Late Victorian criticism promised to present more complicated problems than I was prepared to cope with at the outset. I have therefore taken the romantic theory of poetry more or less for granted, and concentrated on the forty years which roughly constitute the Early Victorian period in English criticism.

It seemed to me in the beginning that a selection of representative documents, if carefully chosen and minutely analyzed, would provide a framework of ideas within which the sum of the critical endeavour of the period might be organized. I therefore fixed on nine more or less extended treatments of poetic theory on the basis of their reputation in modern literary history, and proceeded to explore each theory in terms of its own suppositions. From this study there emerged a certain number of central problems which seemed to characterize the nine treatments as a whole.

At this point I adduced supplementary material, again in the form of more or less extended treatments of poetic theory, but less well known and more representative of the general run of periodical criticism, and this operated on the conclusions already reached in two ways. It confirmed the validity of the central problems as characteristic of the theory of the period, and it served to place the nine theories in a perspective both historical and systematic.

The thesis is therefore presented in two sections. The body contains the expositions of nine individual theories of poetry as they are expressed in single documents, with only so much additional material from the author's other critical writings as will illuminate the specific document; and the introduction contains the separate problems with the characteristic solutions based primarily upon the supplementary materials, but intended as a guide to the better understanding of the individual theories and as an indication of the fundamental relationships of the documents under investigation.

A more comprehensive, less experimental, work on the subject of Early Victorian poetic theory would have to consider a number of important questions which are excluded from this thesis — the relation of poetic theory as a whole in the period to the various movements of philosophy, and the relation of theory to the practice of the major poets, to name only two; but these wider implications of the subject rest on the foundations laid down in the thesis, and must wait for the larger compass of a book.

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H. G. WELLS AS A SOCIOLOGICAL NOVELIST

(Publication No. 3560)

Robert Percy Weeks, Ph. D.
University of Michigan, 1952

This thesis describes and analyzes the differences in technique among the novels of H. G. Wells. As a novelist Wells did his best work in the first third of his career, 1895-1912. As a sociologist and thinker, however, Wells's stature increased as he grew older. Wells thus presents a paradox: as he understood more and more about the society in which he lived, he wrote novels less and less effectively. Most studies of Wells's novels throw little light on this paradox because they focus not on the technique of his novels but on the social thought they contain.

Two questions are central to this study: What caused Wells's early novels to have such a powerful effect on his contemporaries? What causes his later novels to lack the power to produce this effect? To answer the first question, Wells's critical writing and his novels are examined in relation to the two dominant contemporary schools of the novel: the naturalistic school and the school of the well-made novel. Both his theory of the novel and the technique of his early novels are seen as attempts to avoid what he regarded as defects in the principles of these two schools. The second question is answered by tracing the relationship between changes in Wells's social and philosophical thinking and changes in the subject matter and technique of his later novels.

The strength of Wells's early novels lies in the effectiveness with which their protagonists are depicted as struggling to disentangle themselves from the limits of their physical and social environment. The early novels are shown to be dominated by characters who exist in a substantial world that limits them and thus provokes their rebellion. It is found that Wells is no fatuous optimist, however, because for all their energy, ingenuity and daring, the flights of escape almost invariably fail. Even though they fail, they succeed artistically because through their vigor, their color and the solidity of the environment in which they occur, these attempts to escape win our interest and sympathy. The lack of power in the novels written after 1912 is traced to Wells's devotion to the cause of the world state, and to the revisions in his technique he makes to accom-

modate this new subject matter. Its breadth and lack of substance invite intellectual exposition, which Wells conducts by means of his *raisonneurs*, or mouthpiece characters, and its utopian nature leads him to discuss it in terms of Man rather than men.

It is concluded that when Wells writes novels on Man and the world state his technique is such that his novels are close to being pamphlets. But when he writes of the struggles of individual men to escape the restraints of their immediate physical and social environment, the technique he uses often produces novels that possess both brilliance and power.

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"MELITTO-LOGIA" THE MYTHOLOGY OF THE BEE IN EIGHTEENTH-CENTURY GERMAN LITERATURE

(Publication No. 3598)

Lois Armour Westen, Ph. D.
University of Illinois, 1952

The "Melitto-Logia" or Mythology of the Bee in Eighteenth-Century German Literature attempts to trace the motif of the bee in German scientific, theological, political and poetic literature of the eighteenth century. In this period of transition from fixed allegorical tastes to direct personal experience the literary figure of the bee enjoyed particular popularity.

Chapter I, "The History of Beekeeping in Eighteenth Century Germany," shows the emergence of apiculture as a genuine science out of the confusion of half-true, half-fallacious classical theories, of rural folklore, of Christian dogma, and of peasant superstition. While the naturalists Swammerdam, Maraldi, Réaumur and Hüber were the chief contributors to apicultural science abroad, the rural pastors of the German agricultural areas in Saxony, Brandenburg and Bavaria developed a curious half-monopoly over beekeeping and its literature, and did much to promote as well as retard the science of beekeeping. A bibliography of over four hundred eighteenth-century beekeeping books, listing the authors' profession and residence, appears in Appendix I.

Chapter II, "The Physico-Theology of the Bee," discusses the various demonstrations of the reality of God by means of the teleological proof. The frequent occurrence of this proof in theological and philosophical books may be attributed to the powerful influence of Christian Wolff's philosophy upon the academic youth of an entire generation. The conviction carried by the physico-theological proof gives evidence of a very curious aspect of eighteenth-century rationalism which employed natural phenomena (even the bee) to demonstrate supranatural principles and, while defending a deductive system, resorted at need to inductive methods. A bibliography of over sixty physical theologies is appended.

In the image of "The Bee State" (Chapter III) eighteenth-century writers camouflaged their theories on political organization and its origin. Their

descriptions of the beehive reveal the existing political structure and social problems of the German "Ständestaat." Triller sees in the beehive a monarchical state, operating on principles of divine right, Herder a Shaftesburian state, based on mutually altruistic tenets, Storm a Christian state of brotherly love, and the anti-Rousseauist Nicolay, a state organized on the basis of mutual advantage and in response to man's own innate social instincts. Each writer sees his own political ideals manifested in the bee state.

Symbolically the bee is used as a poetic device by many eighteenth-century poets in fables, pastorals, idylls, religious hymns, epigrams, satires, dramas and lyrical poems. Chapter IV, "The Symbolism of the Bee," attempts to clarify the ethical, religious, aesthetic or cultural values of the writer by means of his use of the bee image. In the predilection of the age to engage in abstract reasoning or concealed theological deduction the bee comes to represent such practical virtues as industry, utility, self-control, love, and such metaphysical concepts as the soul. The more indebted an author may be to the emblematic and allegorical tradition of the baroque age, the more complex the structure of his poetic symbolism is likely to be. The more we succeed in analyzing the bee symbol in his writings, the more we can hope to penetrate into an author's standard of values.

Chapter V, "The Bee as a Naturalistic Element in Eighteenth-Century Poetry," helps us to determine a poet's attitude toward nature and to judge the depth of his feeling and his skill as a poet. It helps us in analyzing either his experiential or his conceptual attitude toward the world, either his emotional or his rational approach to natural phenomena, his "naive" or "sentimental" view of existence.

Thus the "mythology of the bee" attempts to introduce the reader to some new and unusual aspects of the cultural, intellectual, and philosophical backgrounds of eighteenth-century Germany.

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SOCIAL CRITICISM IN THE EARLY WORKS OF ERICH KÄSTNER

(Publication No. 3563)

John Winkelman, Ph. D.
University of Michigan, 1952

Erich Kästner, born in Dresden in 1899 and now living in Munich, is best known, especially in the United States, as the author of children's books such as *Emil und die Detektive*. His primary literary significance, however, derives from a number of volumes of lyric poetry and a novel, *Fabian*, all published during the crucial years between 1928 and 1932, in which he depicts the deterioration of manners and morals in Germany, with Berlin as his particular example, in the dying days of the Weimar Republic. Kästner's literary activity in this direction

came to an abrupt end when Hitler seized power, Kästner being one of the twenty-four German authors whose works were publicly burned in Berlin in May, 1933.

The major purpose of the present investigation is to analyze Kästner's pertinent publications as *Zeitkritik*, social criticism, with a view to establishing their truth-value and by implication their intrinsic historical significance.

The Introduction traces and evaluates the somewhat meager studies previously devoted to Kästner. This is followed by two "background" chapters, one dealing with Kästner's life and literary career, the other with the internal structure of the Weimar Republic in which he lived and wrote. The body of the dissertation presents the German scene as viewed and interpreted by Kästner under political, economic, and social perspectives. In each of the corresponding three chapters, the method is by and large the same: The content of Kästner's criticism is compared with sociological and historical fact in a detailed and, when necessary, statistical manner, and as a result these facts are demonstrated to be more or less accurately reflected in the incidents, discussions, allusions, sidelights, implications, and the like found in the poems and in *Fabian*, deviations being critically noted. Especial attention is given to the "Social Scene" proper, where "The Family" and "The Law" furnish the major categories for the marshaling of the facts.

As a result of this comparison, it is found that Kästner recorded the contemporary situation of society, depressing as it was, with penetrating acumen and certainly with no more exaggeration than was called for by his didactic-satiric intent. His method of avoiding sermonizing and of letting the facts speak for themselves is thus made to stand out.

It becomes apparent that Kästner did not expect any reform to be brought about by political or economic measures alone, but that he was striving for a moral regeneration of society through an appeal to the individual sense of responsibility of each and all of its members. Evidence to this effect is summarized for each of the three major chapters, but in particular in the general Conclusion. Given the truth-value of his presentation, Kästner is shown to have been one of the foremost satirists of his age, deeply affected by the general intellectual crisis of the present day. His positive ideals, offsetting the negative approach of the poems and of *Fabian*, may be described as those of a neo-humanism, didactically but constructively developed in his books for children.

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MATHEMATICS

THE PREDICTION OF QUANTITATIVE
CHARACTERISTICS IN POLYGENIC SYSTEMS

(Publication No. 3577)

Allan George Anderson, Ph.D.
University of Michigan, 1952

The object of this paper is to arrive at a satisfactory method of predicting the expected mean value of a given quantitative characteristic of a hybridized strain as a result of knowing the corresponding values for certain of the ancestors from which it is descended. A typical example of this general situation is yield of corn, and illustrations are given of applications to data of that type. A method is devised whereby the expected value of the given characteristic can be predicted for any hybrid having a pedigree showing it to be descended in any manner from only members of some original set of inbred strains.

The system having as elements the representations of various stocks in terms of their proportions of gene-pairs involving two allelic genes which contribute equally and additively to the quantitative characteristic under consideration is shown to be closed under the operation of crossing. This is done by showing it to be isomorphic to a subset of the normalized elements having non-negative coefficients in a non-associative baric algebra of order three. The expected proportions of loci of the three possible types in a stock are thus seen to be readily obtainable as functions of the proportions in the two parent stocks provided they are unrelated. A method of obtaining stocks which are essentially homozygous is outlined, and it is seen that their use as a starting point greatly simplifies the procedure in practical problems. The crossing of related stocks is discussed, and it is made clear that such crosses lead to less desirable values of the particular quantitative characteristic in question than the more easily computed crosses of unrelated stocks.

The paper shows how the proportions of loci carrying pairs of the effective gene can be estimated for the members of a set of inbred stocks if the values of the quantitative characteristics are known for the stocks themselves and the first generation hybrids resulting from crosses among them. It is thus seen that the expected value of the quantitative characteristic can be predicted for a stock having a pedigree traceable in any way to only members of this set of inbred stocks.

The relative accuracy of the present and proposed methods of prediction is discussed, and it is seen that while each represents a step in the right direction there remains considerable room for improvement. Possible directions in which this improvement might be made are then indicated.

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THE NON-CENTRAL WISHART DISTRIBUTION
AND ITS APPLICATION TO PROBLEMS IN
MULTIVARIATE STATISTICS

(Publication No. 2907)

Theodore Wilbur Anderson, Jr., Ph.D.
Princeton University, 1945

In the present paper the non-central Wishart distribution is derived for the rank one and rank two cases. Knowledge of this distribution is applied to such problems of multivariate statistics as finding the moments of the generalized variance and the moments of the criterion for testing linear hypotheses in the non-central cases. From the non-central Wishart distribution the distribution of the roots of certain determinantal equations is derived. Likelihood ratio criteria are developed for testing dimensionality of population means.

The non-central Wishart distribution is the joint distribution of the sums of squares and cross-products of deviations (from the sample means) of observations from normal multivariate distributions, the expected values of which are not identical from observation to observation, but the population variances and covariances are. The non-central Wishart distributions are given explicitly for the cases of the means lying on a line or on a plane, when considered as points in the space of the variates of the populations. In the linear case the distribution is essentially a Wishart distribution multiplied by a Bessel function; in the planar case the distribution is a Wishart distribution multiplied by an infinite series of Bessel functions. In general the non-central Wishart distribution is the product of a Wishart distribution and a function of the roots of a determinantal equation involving the matrix of squares and cross-products and the matrix of population means. The characteristic function of the distribution is given. It is shown that the convolution of two non-central Wishart distributions with the same variance-covariance matrices is a non-central Wishart distribution.

The sample generalized variance is defined as the determinant of the sample variances and covariances. The moments of the generalized variance in the cases where the means of the observations lie on a line or on a plane are derived from the corresponding non-central Wishart distribution. In the linear case the moments are an infinite series involving the variance of the population means which is the root of a determinantal equation. In the planar case the moments are a triple infinite series involving the two non-central roots of a certain population determinantal equation.

The likelihood ratio criterion for testing the hypothesis that the means of a set of populations are identical, given that the population variances and covariances are the same, is a ratio of two determinants. One is the determinant of variates distributed according to a Wishart distribution and the other is the determinant of the same matrix augmented by a set of non-centrally distributed variates such that the new elements have a non-central

Wishart distribution when the hypothesis is false. The moments of this criterion derived from knowledge of the non-central Wishart distribution are infinite series when the means are on a line and triple infinite series when the means are on a plane. The asymptotic distribution of the criterion when the null hypothesis is false is a non-central X^2 distribution.

The likelihood ratio criterion is developed for testing on the basis of a set of m samples each drawn from a normal multivariate population the hypothesis that the means of the set of populations in p variates lie on an h dimensional hyperplane given that the matrices of variances and covariances are identical. The criterion is a power of the product of 1 plus the $p-h$ smallest roots of the determinantal equation involving the sample estimate of the matrix of variances and covariances and the sums of squares and cross-products of deviations of sample means.

The maximum likelihood estimates of the hyperplanes and the positions of the population means on the planes are given. The asymptotic distribution of the criterion is shown to be the X^2 -distribution.

The distribution of the roots involved in the test of dimensionality can be derived in the cases of the population means being on a line or a plane. The distribution is given explicitly for the linear case. For the planar case, the distribution is indicated as a certain definite integral.

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MAPPING THEOREMS IN NON-COMPACT SPACES

(Publication No. 2937)

Clifford Hugh Dowker, Ph.D.
Princeton University, 1938

The central theme of this paper is the extension to more general spaces of the theorems of Hopf¹ and Bruschi² on the mappings of complexes on spheres. Since the best statement of these theorems is in terms of cohomologies, the latter are used throughout the paper.

In this paper a careful distinction is made between homotopy and uniform homotopy, the latter being stricter than homotopy and reducing to it for compact spaces.

It is shown that if we use Čech cocycles³ the theorems of Hopf and Bruschi can be extended to compact normal spaces, in particular to all bicomact Hausdorff spaces. If, in the statements of these theorems, homotopy is replaced by uniform homotopy, the theorems are true for all normal spaces. If, on the other hand, we keep homotopy but suitably alter the cohomology theory (by introducing infinite cocycles), the theorems are true for all metric separable (but not necessarily compact) spaces.

We may also mention the following noteworthy results: (a) The 1-dimensional Čech Betti number

of the straight line in the power of the continuum.

(b) The theorem of Alexandroff, Hopf, and Pontrjagin⁴ on the equality of homology dimension to Menger-Urysohn dimension can be extended to all metric separable spaces. (c) Bruschi's theorem in the form given by Eilenberg⁵ can be extended to locally compact locally connected metric separable spaces, but not further. (d) We prove a metrisation theorem⁶ which may be described as follows: Let R be a space such that every covering by open sets has a refinement which is locally finite. Then the necessary and sufficient condition that R be metrisable is that R be normal and that there exist a sequence $\{U_i\}$ of coverings of R by open sets such that if x is a point of R and U is an open set containing x , there is a covering U_i of the sequence such that every open set of U_i which contains x is contained in U .

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MEASURE AND INTEGRAL IN PARTIALLY ORDERED SPACES

(Publication No. 2992)

Paco Axel Lagerstrom, Ph.D.
Princeton University, 1942

The object of this study is to construct a Lebesgue measure and a Lebesgue integral, the functions and measures taking their values in a partially ordered space. In Ch. III the Caratheodory theory of the extension of a finitely additive measure to a Lebesgue measure is generalized. It is shown that very few assumptions on the value-space are needed. It is assumed that it is a partially ordered space with a greatest and a smallest element and an associative, commutative, monotone "addition," (an "O-space," O). Furthermore in order to insure the existence of an outer measure one must assume that monotone O -valued functions on directed sets tend to a limit (a "sup" or an "inf"). Finally the fundamental inequality $\bar{m} \vee a_i \leq \sum \bar{m} a_i$ requires certain assumptions on O which are studied in detail in III.3. In Ch. I the general theory of an O -space is developed. The main object of Ch. II is to insure that the theory developed in Chapters III and IV is not void; it is shown that most of the well-known Boolean algebras and vector lattices are O -spaces satisfying the special assumptions made in Chapters III and IV. The same holds for the space of Hermitean operators and the lattice of projection operators (II.8). Particular attention is given to the existence of positive continuous distributive functionals (for linear spaces) and to continuous measures (for lattices). Ch. III first gives the general theory for the extension of an O -valued measure. In 4 and 5 the restriction is introduced that the O -space is a complete Boolean algebra (or a slight generalisation thereof). The theorem about extending a Jordan measure then takes on a special significance; it essentially becomes a theorem about continuation of

a continuous homomorphism between two Boolean algebras. At the same time the theory has an application to spectral theory of Hermitean operators (a problem which has also been treated by Lorch). Ch. IV treats the Lebesgue integral; several different methods for constructing the integral are considered. As in Ch. II, I have tried to make as much use as possible of the ordering of the value space; thus the methods are in general totally different from the above-mentioned theories of an abstract-valued integral. In § 1, though, I have applied a device by Gelfand by using the linear functionals on the value-space, but even here the assumption of an ordering in the value-space induces a significant change in the theory (cf. Gelfand, p. 253). The reason for this is easy to see: a characteristic property of the ordinary Lebesgue integral is that it is an order-preserving operator on the integrable functions. This property is preserved in our theory, but is of course meaningless if no assumption is made on the ordering of the value-space. On the other hand it makes sense to speak about the countable additivity of the integral even if no neighborhood topology is defined in the value-space, because countable summation is defined with the help of finite summation and a concept of limit and an ordering of a set introduces automatically a limit topology (which e.g. in the case of real numbers coincides with the ordinary topology). — Daniel has given an elegant theory of the Lebesgue integral which is very powerful since it at the same time yields the extension of a Jordan measure to a Lebesgue measure. In its abstract form (developed in § 7) it is even more powerful since an application of it immediately yields a substantial part of the proof of a strong form of the theorem about integral representation of a bounded Hermitean operator.

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ON THE THEORY OF LIGHT QUANTA

(Publication No. 3023)

Maurice Henry Lecorney Pryce, Ph.D.
Princeton University, 1937

Abstract not available.

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ARBITRATION SCHEMES FOR GENERALIZED TWO-PERSON GAMES

(Publication No. 3548)

Howard Raiffa, Ph.D.
University of Michigan, 1952

In the two-person zero-sum game it is quite realistic to define a unique value of the game and

optimal strategies for each player. If each player is aware, and knows his opponent is also aware, of the mathematical solution of such a game, then there is no advantage for the players to act out of conformity with the predicted mathematical solution. Further, because of the strictly competitive nature of the zero-sum game, there is no mutual advantage for the players to have any pre-play communication between themselves. However, in the non-zero-sum game it is necessary to distinguish between the non-cooperative game, where the rules prohibit pre-play communication, and the cooperative game in which the players can discuss possible joint strategies.

It is shown that the inherent nature of certain non-cooperative two-person games precludes the possibility of developing a theory of so-called "rational behavior" as was possible in the development of the zero-sum case. Even though the mathematical axiomatic structure of game theory does not fully reflect the psychological factors of the non-cooperative game, various concepts are introduced in the partial analysis of such games which are quite realistic.

John von Neumann and Oskar I. Morgenstern in *Theory of Games and Economic Behavior* associate to each cooperative non-zero-sum game a family of possible returns to the players (in the economic interpretation this family has been called the socially optimum set, the contractual curve, or the Pareto maximal set). The multiplicity of solutions is in harmony with realizations of the mathematical model and the actual solution attained in the given real life situation depends on the psychological behavior of the players in this bargaining problem. The motivation for this report stems from the realization that the utter futility of requiring the players to choose a "best" element from a set of incomparable elements often results, empirically, in the players refusing to act cooperatively. A non-cooperative solution is then attained which may be compositely dominated by every element of the socially optimum set. In situations of this type it behooves the players to offer their case for arbitration. A scheme of arbitration is an overall methodology, given a priori, which resolves "almost" all two-person generalized games — i.e. it is a convention which associates to every game a unique element of the socially optimum set. Naturally, to be realistic the arbitration convention must reflect the threat powers of the players in the corresponding non-cooperative game. A general existence theorem on the arbitrated solutions of a game relative to various conventions is supported by appropriate computational techniques. Any preference for a given convention will be purely subjective and rationalizations for the use of a particular convention will be on the metatheoretic level. To aid in the subject evaluation of various arbitration schemes, several simple but provocative games are arbitrated according to the conventions.

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MEDICINE

THE PROBLEM OF CONSTRUCTION OF A PUMP AND OXYGENATOR TO REPLACE THE HEART AND LUNGS FOR BRIEF PERIODS

(Publication No. 3412)

Karl Eugene Karlson, Ph.D.
University of Minnesota, 1952

Some congenital and acquired anatomical defects of the heart may be surgically corrected. A method of temporarily deviating the blood from the heart would enable the surgeon to visualize these defects and deal with them most satisfactorily. Such a method requires mechanical pumping of the blood and, because of the difficulties inherent in cannulating the lungs, mechanical oxygenation. A number of different methods of oxygenation have been studied and a pump-oxygenator apparatus has been constructed to replace the heart and lungs of the dog for brief periods.

EVALUATION OF OXYGENATORS

Four types of oxygenators have been studied: (1) The Kolff "artificial kidney." (2) An apparatus consisting of three cylinders lying one inside the other at about 15° slant so that blood films on the inner surface of the outer cylinder, the outer and inner surfaces of the middle cylinder, and the outer surface of the inner cylinder. (3) A vertically mounted revolving cylinder which is filmed with blood on the inner surface. (4) A vertically mounted revolving funnel which is filmed with blood on the inner surface.

These oxygenators have been compared on the basis of the amount of oxygen introduced into the blood per minute per unit of blood in the oxygenating component (cc. O₂ introduced per minute per cc. content). The Kolff apparatus introduces 0.05 cc. (maximum). The horizontal cylinder oxygenator introduces 0.39 cc. (maximum). The vertical revolving cylinder introduces 0.20 cc. (average). Half of the surface of the revolving cylinder introduces 0.25 cc. (average). The vertical revolving funnel introduces 0.15 cc. (average) of oxygen per minute per cc. of blood on the oxygenating surfaces. A large amount of foaming occurs in the multiple horizontal cylinder oxygenator, but there is no foaming on the vertical revolving cylinder.

MULTIPLE VERTICAL REVOLVING CYLINDERS

Because studies showed that a vertical revolving cylinder 20 cm. high and 18 cm. in diameter is the most efficient foam-free oxygenator available, an apparatus capable of oxygenating enough blood (2000 cc. per minute) to support the circulation of the laboratory dog has been constructed from eight such cylinders with an 18 cm. average diameter. These cylinders are mounted concentrically above a funnel. Cylinders and funnel are rotated at 150 r.p.m. as a unit on a hollow shaft. Blood is filmed on the inner surfaces of the cylinders, runs down the inner sur-

face of the funnel, flows into the hollow shaft, and is collected in a cup below the shaft. The film area is 14,500 cm.² Blood is pumped from the animal and returned to the animal with modified Dale-Schuster pumps. Filling the entire apparatus requires approximately 800 cc. of heparinized blood. Foaming is absent and hemolysis is insignificant with this apparatus.

ANIMAL PERFUSION STUDIES

The pump-oxygenator apparatus has been used in five experiments during which venous blood was withdrawn from the vena cava of heparinized dogs, and returned to the animal via the femoral arteries. Four animals died immediately post-perfusion, but one survived normally until sacrificed 49 days later. Up to 1250 cc. of blood per minute was oxygenated using a maximum of six cylinders. Maximum oxygen saturation was 90 per cent. An average of 0.28 cc. of oxygen was introduced into the blood per minute per cc. of blood in the oxygenator. The average oxygen uptake was 69.2 cc. per minute and the average content of the oxygenator was 249 cc.

An average carbon dioxide content of venous blood of 45.1 vol. per cent dropped to 37.1 vol. per cent in the arterial blood after one passage through the oxygenator. Plasma hemoglobin concentration did not increase more than 0.14 mgm. per cent during perfusion (up to 32 minutes of extra-corporeal deviation of circulation).

This apparatus may be used to study the physiological effects of artificial maintenance of the circulation and determine the feasibility of possible clinical application to cardiac surgery.

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PHARMACOLOGY

A STATIONARY MANOMETRIC RESPIROMETER FOR ISOLATED RAT DIAPHRAGM ALLOWING SIMULTANEOUS DIRECT REGISTRATION OF MECHANICAL ACTIVITY WITH OBSERVATIONS ON SODIUM AZIDE AND 2, 4 DINITROPHENOL

(Publication No. 3559)

James Robert Weeks, Ph. D.
University of Michigan, 1952

A respirometer for studying activity and resting metabolism of isolated mammalian skeletal muscle is described. It is a constant volume glass vessel whereby oxygen consumption is measured manometrically as in the Warburg apparatus. The vessel is held stationary, and the liquid and gaseous phases kept in equilibrium by re-circulating the gas (about five ml. total) through the saline medium using a self-contained system of ball valves and a pump actuated hydraulically. Strips of rat diaphragm are

stimulated electrically and the contractile activity led out of the vessel on a human hair passing through a gastight "packing" consisting of a drop of mercury between two successive capillary constrictions.

2, 4 Dinitrophenol (10^{-6} M) caused about a one-third increase in resting respiration without contracture (direct kymographic recording). At 10^{-5} M, respiration was more than doubled and contracture induced. The onset of contracture was delayed about thirty minutes, but there was no significant difference in the respiratory rate before and after onset of contracture.

Sodium azide (10^{-4} M) caused a small but significant increase in resting respiration, also without inducing contracture. At 10^{-3} M, there was a greater increase in respiration, but such concentrations rapidly led to a contracture within a few minutes.

Maximal isometric twitches at 200 per minute for 30 minutes increased the mean QO_2 ($\mu l. O_2/mgm.$ dry weight/hour) of controls from 4.22 to 6.88. At the sub-contracture concentration of dinitrophenol, the muscles contracted normally and the increased oxygen uptake due to activity did not differ significantly from control values. Similar results were obtained at sub-contracture concentrations of sodium azide.

A few limited experiments were conducted using monkey papillary muscles. The addition of ouabain (1:10,000,000) to the hypodynamic muscle caused a parallel increase in amplitude of contraction and oxygen uptake. This increased respiratory rate, once established, continued at substantially the same level after mechanical activity had disappeared. There was no evidence of contracture.

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PHILOSOPHY

INSTITUTIONS AND INSTITUTIONAL CHANGE

(Publication No. 2980)

Charles Crawford Irvine, Ph.D.
Princeton University, 1942

Abstract not available.

Microfilm copy of complete manuscript of 221 pages, \$2.76. Enlargements 6" x 8", 10¢ per page.

THE PARADIGMATIC INTERPRETATION OF PLATO'S IDEAL THEORY

(Publication No. 3029)

David Orison Robbins, Ph.D.
Princeton University, 1939

Abstract not available.

Microfilm copy of complete manuscript of 156 pages, \$1.95. Enlargements 6" x 8", 10¢ per page.

PHYSICS

THE PRINCIPLE OF LEAST ACTION IN QUANTUM MECHANICS

(Publication No. 2948)

Richard Phillips Feynman, Ph.D.
Princeton University, 1942

A generalization of quantum mechanics is given in which the central mathematical concept is the analogue of the action in classical mechanics. It is therefore applicable to mechanical systems whose equations of motion cannot be put into Hamiltonian form. It is only required that some form of least action principle be available.

It is shown that if the action is the time integral of a function of velocity and position (that is, if a Lagrangian exists), the generalization reduces to the usual form of quantum mechanics. In the classical limit, the quantum equations go over into the corresponding classical ones, with the same action function.

As a special problem, because of its application to electrodynamics, and because the results serve as a confirmation of the proposed generalization, the interaction of two systems through the agency of an intermediate harmonic oscillator is discussed in detail. It is shown that in quantum mechanics, just as in classical mechanics, under certain circumstances the oscillator can be completely eliminated, its place being taken by a direct, but, in general not instantaneous, interaction between the two systems.

The work is non-relativistic throughout.

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HIGH ENERGY NEUTRON-PROTON SCATTERING AND THE MESON THEORY OF NUCLEAR FORCES WITH STRONG COUPLING

(Publication No. 3000)

José Leite Lopes, Ph.D.
Princeton University, 1946

In this work we investigate the anisotropy of the scattering of 14 Mev.-neutrons by protons in the meson field theory of nuclear forces with the scheme proposed by Møller and Rosenfeld in the strong coupling limit and in the symmetrical form. In the second Born's approximation, the virtual excited states (isobars) of the nucleons decrease the ratio R of the differential cross sections in the backward and perpendicular directions (in the center of mass system), and R decreases with the isobar energy.

However, R is still larger than 1 and our results suggest the possibility that the combined effects of the virtual isobars and the tensor force might give a forward scattering in agreement with Amaldi's experiments. In the second Part we evaluate the total cross section of the inelastic scattering of 100-200 Mev. neutrons by protons with production of isobars, in the Møller-Rosenfeld, pseudoscalar and Schwinger theories (in first Born's approximation). The total cross section is of the order of 10^{-26} cm², and its ratio to the elastic cross section 0.03, for 100 Mev. bombarding neutrons; the isobar energy assumed in this Section is 45 Mev. An experiment to detect the isobars would be crucial for a decision between the assumptions of the weak coupling and strong coupling theories.

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MOBILITIES OF IONS IN COLLODION MEMBRANES

(Publication No. 3596)

William Gates Moulton, Ph.D.
University of Illinois, 1952

From a measurement of the total current passing through collodion membranes, and a measurement of the current carried by the H_2PO_4^- ion, the anion transference number of phosphoric acid in the membranes was calculated. This was done as a function of concentration, temperature, and state of oxidation of the membranes. P_{32} in phosphoric acid was utilized to measure the H_2PO_4^- ion current. The resistance of the membranes in phosphoric acid was measured by a direct current method using phosphate probing electrodes. The ionic equivalent conductance of H^+ and H_2PO_4^- in the membranes were calculated from these measurements.

The results of these measurements were found to be consistent with the mechanism of transport in collodion membranes postulated by Sollner and others, in which the anion is inhibited by fixed negative groups attached to the membrane walls, while the cation passes through the membrane by exchange.¹

The transference numbers and resistance of the membranes were found to be independent of the current density, provided sufficiently small current densities were used. If current densities which were too high were used, the resistance and transference numbers were found to be a function of the current. These effects were investigated, and it was found that the potential drop across the membranes with a high current flowing through the membrane consists of an RI drop, and a polarization potential. It was shown that these effects can be accounted for by a concentration gradient in and near the membrane.

1. Sollner, K. Recent Advances in the Electrochemistry of Membranes of High Selectivity, Journ. Electrochem. Soc. 97, 139.

Microfilm copy of complete manuscript of 79 pages, \$1.00. Enlargements 6" x 8", 10¢ per page.

A STUDY OF THE GAMMA RAYS ASSOCIATED WITH SELECTED NEUTRON-INDUCED RADIOACTIVITIES

(Publication No. 3589)

Wyman Coe Rutledge, Ph.D.
University of Michigan, 1952

It is the primary purpose of this investigation to present an evaluation of the energies up to 1.5 Mev of the gamma rays that are emitted by various radioactive nuclei. A second aim is to determine the multipolarity and character of the prominent gamma rays from measurements of their energies and K/L ratios. A final purpose is to present an energy level scheme for each of the radio-nuclei.

The energies of the gamma rays are determined primarily from studies of associated internal conversion electrons and photo-electrons using conventional photographic beta spectrometers. A new multiple O-ring vacuum seal permits the introduction of a radioactive sample into the camera in one second without an appreciable loss of vacuum. By locating the spectrometers close to the heavy water moderated nuclear reactor of the Argonne National Laboratory, it was possible to study activities with half-lives as short as ten seconds. Changes in spin and parity are determined for each prominent gamma ray from its multipolarity and character, which are in turn determined from its energy and the ratio of its K and L internal conversion electrons. These ratios are based upon measurements of the areas of photometric traces of the corresponding electron lines, which are corrected for background, exposure, attenuation due to the geometry of the camera, and energy sensitivity of the photographic emulsion. The energy level schemes are then proposed on the basis of identities of mathematical sums of the energies of the gamma rays, coincidence studies, and conservation of spin and parity between the levels.

The following radio-nuclei were examined: $\text{Se}^{77\text{m}}$ (17.5 sec), $\text{Se}^{79\text{m}}$ (3.5 min), $\text{Se}^{81\text{m}}$ (58 min), Se^{81} (17 min), Se^{83} (69 sec), Se^{83} (26 min), Nd^{147} (11.9 da), Nd^{149} (1.8 hr), Nd^{151} (12 min), Pm^{149} (50 hr), Pm^{151} (27.5 hr), Sm^{145} (410 da), Sm^{151} (> 20 yr), Sm^{153} (46.5 hr), Sm^{155} (23.5 min), Eu^{155} (1.7 yr), Mo^{101} (14 min), Tc^{101} (15 min), and Th^{233} (23.6 min). The 27.5-hour activity assigned to Pm^{151} was discovered in this work. The assignment of the 12-minute activity resulting from the bombardment of neodymium was changed to Nd^{151} . The energies of many new gamma rays are evaluated within ± 0.3 per cent, and several new energy level schemes are presented. The K/L ratios are often determined within ± 10 per cent. For Kodak NTB emulsion 25 microns thick it is found that the photographic density varies linearly with exposure up to densities of at least 1.6. Curves of the attenuation of the intensity of electron lines due to the geometry of the camera and the energy

sensitivity of the emulsion are presented. In a comparison of K/L ratios obtained by the photographic method with those by a constant-radius spectrometer, excellent agreement is found.

The photographic method appears to be the best method of obtaining K/L ratios of gamma rays associated with short half-lives. In general, the predominant L-conversion for magnetic dipole, electric quadrupole, and electric octopole transitions occurs in the L_I , L_{II} , and L_I sub-shells respectively.

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ANIONIC SELF-DIFFUSION AND ELECTRICAL CONDUCTION IN SODIUM BROMIDE

(Publication No. 3550)

Homer Ward Schamp, Jr., Ph. D.
University of Michigan, 1952

The primary purpose of the investigation is to determine whether it is probable that ionic diffusion in the solid alkali halides proceeds by the movement of pairs of vacancies. It is shown that the occurrence of pairs can be determined by using the Einstein relation to compare the rate of diffusion of the anion with the ionic conductivity of the salt. The secondary purpose of the investigation is to determine transport numbers for the bromide ion in sodium bromide.

A thin layer of sodium bromide containing the radioactive bromide ion was evaporated onto one face of a single crystal of the compound. The specimen was then heated for a definite length of time, cooled, and sectioned to determine the distribution of radioactivity in the crystal. Knowledge of the distribution of radioactivity and the length of time during which diffusion occurred made it possible to determine the diffusion coefficient of the bromide ion. Measurements of the anion diffusion coefficient were performed at several temperatures in the range from 360° C. to 688° C.

The ionic conductivity of sodium bromide was measured in a similar temperature range, using a Wheatstone bridge with an oscilloscope as detector. A DC pulse of short duration was applied to the bridge. The specimens measured were the same as those in which the diffusion coefficient had been measured.

Above 450° C. the results of the direct measurement of the diffusion coefficient are quantitative and can be expressed as $D_{Br} = 50 \exp(-2.02/kT) \text{ cm}^2/\text{sec}$. It is shown that below this temperature the actual coefficient is certainly lower than the measured value.

The diffusion coefficient calculated from conductivity can be expressed as $D_{con} = 4.36 \exp(-1.66/kT)$ at high temperatures and as $D_{con} = 6 \times 10^{-6} \exp(-0.80/kT)$ at low temperatures.

The ratio $D_{Br}/D_{con} = 11.5 \exp(-0.36/kT)$ is taken as a measure of the transport numbers in the range of temperature from 500° C. to 700° C.

It is shown that at low temperatures the diffusion coefficient directly measured is at least 30 to 40 times smaller than the coefficient calculated from conductivity, and it is concluded that the existence of pairs is unlikely.

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THE EFFECT OF ATMOSPHERIC TEMPERATURE VARIATIONS ON COSMIC-RAYS UNDERGROUND

(Publication No. 3551)

Noah Sherman, Ph. D.
University of Michigan, 1952

The variations in the intensity of cosmic-rays observed underground, in a salt mine 1100 ft, which is 846 meters water equivalent (mwe), below the surface, are correlated with variations in temperatures in the stratosphere and at sea-level, over the period from April 1, 1951 to November 30, 1951. Two trays of Geiger counters were operated in coincidence as a vertical telescope and this apparatus with associated electronic equipment was set up in the mine (in Detroit, Michigan) to record the hourly rate of cosmic-rays. The atmospheric temperatures at the 100, 150, 200, 300 millibar (mb) pressure levels, and sea-level were measured with radiosonde equipment sent aloft in balloons by the personnel of the weather observation stations located at Selfridge Field, Michigan and Toledo, Ohio. The cosmic-ray intensities and the atmospheric temperatures recorded at times corresponding to those of the cosmic-ray observations are employed in the study of the effect of temperature variations on the intensity of cosmic-rays underground.

The theoretical model, describing the production of mesons, is developed on the basic assumption that μ -mesons originate only in the decay products of π -mesons and this model is shown to indicate an expected temperature coefficient of ~ 0.4 percent per degree for μ -mesons of energy $> 10^{11}$ ev. The cosmic-rays observed in the salt-mine are μ -mesons, with essentially this average energy, and their secondary products. The correlation analysis of the atmospheric temperatures and observed cosmic-ray intensity is performed for each pressure level separately and the following experimental temperature coefficients are obtained: at 100 mb -0.062 ± 0.042 percent per degree, at 150 mb -0.056 ± 0.039 percent per degree, at 200 mb -0.012 ± 0.034 percent per degree, at 300 mb -0.014 ± 0.029 percent per degree, and at sea level -0.011 ± 0.017 percent per degree. These results are considerably smaller than the predicted theoretical value and lie well outside the uncertainty inherent in the mathematical treatment of the π - μ decay model.

The accuracy of the experimental procedure is established and the significance of the disagreement between experimental and theoretical results is discussed. It is concluded that the π - μ decay model

model does not describe the origin of μ -mesons of energy $> 10^{11}$ ev. Consideration is given to the pertinent properties of hypothetical particles which could replace π -mesons as the progenitors of μ -mesons. In view of the recently discovered κ -meson, which has been observed to decay into a μ -meson, this particle is suggested as a possible parent of high-energy μ -mesons. Using the observed mass of the κ -meson (~ 1200 electron masses) and a mathematical model similar to that developed for π -mesons, it is found that if κ -mesons are the parents of μ -mesons of energy $> 10^{11}$ ev, then a maximum value of 4×10^{-10} sec for the mean lifetime of κ -mesons would be associated with a maximum temperature coefficient of 0.08 percent per degree.

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THE REACTION OF THIN BEAMS AND SLABS TO IMPACT LOADS PART III SLABS

(Publication No. 3044)

Ralph Jeffery Slutz, Ph.D.
Princeton University, 1946

The equations of motion for transverse vibrations of thin slabs are solved for slabs infinite in extent and for square slabs simply-supported at their edges. For an infinite slab, the use of the double Fourier integral results in closed analytic expressions for the central deflection and bending moment produced by a concentrated central force or by a central force having a Gaussian distribution over the surface of the slab. For a square simply-supported slab, the double Fourier series leads to doubly-infinite series for deflection, bending moment, and shear. Approximation methods are developed which permit the assignment of upper and lower bounds to the contributions of the remainders of these series, and using these methods the summation is carried out for six representative loadings to give values for the deflection and energy absorption known to within definite — and close — limits. The results are presented in a form intended to be useful for application to typical cases, and an example is given of their use in determining the elastic vibration energy imparted to a plate by a projectile's striking it.

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A STUDY OF GRAIN SIZE EFFECTS IN THE LUMINESCENCE OF ZINC SULPHIDE PHOSPHORS

(Publication No. 3557)

George Castor Wallick, Ph.D.
University of Michigan, 1952

The purpose of this investigation is to determine whether or not surface effects play a role in the

luminescence of ZnS phosphors. If this were the case, the phosphorescence and thermoluminescence characteristics of these phosphors would depend upon the crystal size. There is some evidence in the literature for such a size dependence but the data presented is unsatisfactory and inconclusive. Experimental information concerning these effects is necessary for a more satisfactory theoretical description of luminescence phenomena.

A new method of crystal size separation is described which insures that the luminescence properties of the phosphor crystals are not changed by the separation process. It is found that when a small amount of the phosphor powder is placed at the lower end of an inclined glass plate and the lower edge of the plate is tapped gently, the largest crystals travel the greatest distance up the incline.

Measurements of the phosphorescence of sized samples of two standard phosphors, hex.-ZnS:Ag (RCA 33-Z-20A) and hex.-9ZnS.CdS:Cu (RCA 33-Z-21A), following excitation to equilibrium with high and low intensity 3650A radiation show a small but consistent difference in the decay of large and small crystals. Although the later portions of the decay curves are the same for all crystal sizes, the initial rate of decay increases with decreasing crystal size.

Measurements of the thermoluminescence intensity of both phosphors over a temperature range from -160° to $+100^{\circ}$ C reveal that the smaller crystals contain many more shallow electron traps than do the larger crystals. The distribution of deeper traps is found to be independent of crystal size.

It is shown that the more rapid initial decay of the smaller crystals is consistent with the fact that they contain more shallow traps. It is further shown that the later stages of decay should be insensitive to crystal size. A graphical analysis of the thermoluminescence curves for hex.-9ZnS.CdS:Cu demonstrates that the shallow traps are definitely associated with the crystal surfaces. It is concluded that surface traps do exist in ZnS phosphors and that they are not as deep as those traps in the crystal interior.

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PHYSIOLOGY

PROBLEMS ASSOCIATED WITH SUPEROVULATION AND TRANSPLANTATION OF FERTILIZED OVA IN THE BOVINE

(Publication No. 3647)

John Dick Donker, Ph.D.
University of Minnesota, 1952

The major problems associated with the technique of transplanation of fertilized ova are superovulation of the donor, isolation and storage of ova,

transfer methods and synchronization of estrous cycles. Modifying influences must be considered in the integration of physiological processes necessary to bring about a successfully completed pregnancy of a transferred ovum.

Attempts were made to develop a practical approach to ova transplantation to be applicable to field trials.

Presented are the results of 38 superovulation trials using pregnant mare's serum (PMS), pituitary gonadotropins of sheep and hogs and human chorionic gonadotropin. Stilbestrol was used as an adjuvant in certain trials. The most successful trials were those in which 6000 rat units of PMS were administered subcutaneously at the 15th day post-estrus or after stilbestrol administration had brought the ovaries to a quiescent state. After an interval of follicular development due to PMS an intravenous injection of 100 mg. of unfractionated sheep pituitary gonadotropin was given to effect ovulation. Human chorionic gonadotropin was tested as an ovulating substance. The dosage levels necessary to achieve desirable results are very critical. Hog pituitary follicle-stimulating hormones have also been successfully used in superovulation trials. It was found that prior recycling did not interfere with the superovulation response. Superovulation was repeated in certain animals. There is danger of sensitization after using PMS. Animals respond to retreatment with symptoms of anaphylaxis. Trials were conducted to attempt the demonstration of antibodies to PMS as an explanation to the refractivity noticed. Antihormones were not demonstrated by the biological assay methods utilized. Attempts were made to study the functionings of the genital organs by endoscopic methods. Two trials by different methods showed little success. Temporary peritoneoscopy shows promise to be a great aid to this study. Morphological and histological studies were carried out on ovaries of superovulated animals to note the effects of the hormones on these structures. The great size attained by the ovaries is thought to possibly embarrass the functional activity of the infundibulum and so explain the fact that in certain instances ova were recovered only from one side of the uterine tract in excised organs and to partially explain low fertility and recovery of ova after treatment.

There were 42 trials of attempted ova recovery in intact cows. The greatest success was had by a method whereby the uterus was infused with 150 cc. of fluid by use of a self-retaining catheter fixed within the cervix. There was a study included which involved the measurements of the fluid capacities of 66 freshly excised uteri. While not able to detect if the stage of the cycle effected the capacity, it was felt that 150 cc. of fluid was a volume which would result in moderate distension of the uterus.

There are 23 recycling trials reported. Progesterone was quite successful. Testosterone propionate and electrical stimuli as used were not effective in bringing about ovarian stasis. It is seen that progesterone administered soon after heat for a period of a week does not interfere with

the genesis of the corpus luteum but might shorten its activity somewhat.

The description and utilization of a uterine biopsy instrument is presented. The biopsy operation was successfully performed 22 times on five animals without deleterious effects and the tissues were found to be histologically normal when compared to timed slaughter material.

Included in this report are a series of photographs of superovulated ovarian tissue, biopsy material and of ova.

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THE EFFECTS OF BETA RAYS ON THE CONDUCTED ACTION POTENTIALS OF NERVES

(Publication No. 3648)

Edgar Lionel Gasteiger, Jr., Ph.D.
University of Minnesota, 1952

A critical review of previous investigations concerned with the effects of ionizing radiations on peripheral nerves reveals the following points. Peripheral nerves, like central nervous tissue, are highly resistant to irradiation. Young or embryonic nerves are more sensitive than mature fibers. A three-stage response is seen in the irradiated peripheral nerve: Stage I - excitability of the fibers increases, Stage II - excitability decreases, and Stage III - the fibers become inexcitable. These effects are reversible if the irradiation is not excessive. Sufficient irradiation produces the histological changes observed in Wallerian degeneration. Finally, the three-stage change and its reversibility is observed for ultraviolet light as well as for the more strongly ionizing radiations.

Original experiments on the effects of beta particles on the action potentials of excised sural, saphenous, and vagus nerves of cats were performed with the use of a nerve chamber, linear amplifier, and oscilloscope. A small bulb of radon was placed against the nerves in such a way as to permit the recording of a control as well as an experimental response, and periodic recordings were made with the bulb in place until the nerve ceased to conduct. Survival curves for the components of the compound action potential were obtained by plotting the percentage change of the nerve activity, as expressed by the potentials heights or areas, against the beta dose expressed in millicurie minutes.

From consideration of the potential changes and of the resulting survival curves, several observations were made. As irradiation progressed, the potentials displayed a "walking out" effect with the components of the A and B fibers, decreased in amplitude and increased in conduction time, appearing on the falling phase of the potentials. The survival curves tended to be sigmoidal in shape and showed conclusively that for the A fiber components the order of decreasing sensitivity to the beta rays was delta, gamma, and alpha - or more generally

stated, the sensitivity decreased as the fiber diameter increased. The sensitivity of the sural and saphenous C fibers was indicated as being near that of the delta fibers. For the vagus nerve, the order of decreasing sensitivity was indicated as B, A, and C. At higher temperatures the 37 per cent survival doses were lower and a smaller differential in response existed between fiber groups.

A discussion is presented attempting to explain the survival curve shape and relating the beta ray effects to that of other agents.

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POLITICAL SCIENCE

STATE ADMINISTRATIVE SUPERVISION OF LOCAL FINANCE IN NEW JERSEY

(Publication No. 2919)

Adam Carlyle Breckenridge, Jr., Ph.D.
Princeton University, 1942

New Jersey has developed a state administrative department whose functions are the supervision of local financial administration in budgeting, accounting, auditing, borrowing, and reporting. This agency is the Department of Local Government. Since its beginnings in 1917, the Department has been attempting to discover and determine certain standards which, if adopted and observed by local governments in the state, provide a possible solution to local fiscal problems. Its purpose is to indicate the manner in which fiscal problems may be solved, and it advises and assists local units of government so that there may be no recurrence of such problems.

This state supervision aims at a maximum in local self-government under state prescribed co-operatively applied minimum standards. Successful supervision depends in part, at least, upon a clearly defined legal basis and this was partially accomplished through the efforts of the Princeton Surveys in the reorganization of the Department in 1938. As a result of this reorganization a wiser scheme for controlling and supervising local financial administration has been provided. It compromises the extremes of complete home rule and strong state centralization.

The Department of Local Government in New Jersey seeks to determine standards and methods for more successful financial management in all municipalities and counties within the state. It makes studies of the related fiscal processes and functions of local financial management to seek out the most adaptable forms and procedures. Guided by statutory policy, the Department establishes rules and regulations to insure uniformity in operations and needed flexibility for varying local conditions.

The Department is essentially a service agency in addition to being a controlling and supervising agency. It prepares and distributes budget forms and devises techniques for budget planning. Regulations are promulgated and issued to local financial officers to make the local budget a control budget and not merely a tax ordinance. It provides a uniform accounting formula which is adaptable to all sizes of local governments. It also determines the scope and content of the local audit.

Prior to state supervision of local finance in New Jersey, local borrowing had been the chief trouble-spot in local finances. State supervision, indeed, arose largely as a solution to staggering debt loads, tax delinquencies, and municipal defaults. Although the powers of the Department are not extensive over local borrowing, the local governments are required to maintain annual debt payments to retire outstanding obligations.

When, during the last depression, debts became too burdensome and payments could not be met, many local governments were faced with default. Indeed, many did default on both interest and principal payments. Here again, the Department of Local Government exercised its statutory powers in an effort to place defaulting units on a sounder financial basis. Not only does the Department aid in curing defaults, it attempts to prevent such defaults.

This legal participation of the state in local affairs is a duty and responsibility which the state cannot escape. New Jersey has more recently indicated a desire to encourage and develop uniform standards of service, to insure minimum standards of efficiency, to equalize the capacity to support government, to protect the taxpayer from well-intended but unsound fiscal practices, and to minimize the effects on other local governments of the financial catastrophes of some of the weaker members.

One of the chief difficulties with this state-local relationship arises from the devices designed to accomplish these desires. The devices are as yet far from perfect, and improvement is handicapped by the difficulty of distinguishing between those functions which are of state-wide interest and those which are purely local in character. They vary from locality to locality, and those which appear to be local today are of state-wide importance tomorrow.

State supervision over local finance in New Jersey has not destroyed home rule. Even those municipalities which reach an unsound fiscal condition are released from the restrictions of state control as soon as the causes for unsoundness are cured or are definitely curtailed. As a matter of fact, supervision has been an aid to local self-government. Local self-government cannot exist unless it can be financed, and fiscal dependence means loss of policy control. By helping local units to financial soundness, therefore, supervision helps to preserve their very independence.

Supervision focuses attention upon fiscal problems common to all local governmental units, and those cases requiring special consideration are brought out of the chaos of insolvency. Regardless of the

causes of these fiscal difficulties, the taxpayers and officials require protection from unsound fiscal practices. They are often helpless, however, unless they receive outside guidance. This the Department of Local Government can supply.

But efficient and economical local government cannot come ready-made from a state department. Ultimately, good government is a community responsibility. But as its communities struggle to achieve financial stability, the state cannot stand idly by, indifferent and unconcerned. The welfare of the state is intimately connected with that of all of its parts. And this in large measure, the state of New Jersey has realized. The Department of Local Government is its recognition of the inseparability of state supervision and local finance.

Microfilm copy of complete manuscript of 283 pages, \$3.54. Enlargements 6" x 8", 10¢ per page.

THE POLITICAL PHILOSOPHY OF FRANKLIN DELANO ROOSEVELT

(Publication No. 2926)

Turner Christian Cameron, Jr., Ph.D.
Princeton University, 1940

Abstract not available.

Microfilm copy of complete manuscript of 324 pages, \$4.05. Enlargements 6" x 8", 10¢ per page.

THE ENFORCEMENT OF PRIORITIES, CONSERVATION AND LIMITATION ORDERS OF THE WAR PRODUCTION BOARD, 1942-1944

(Publication No. 2956)

Thomas James Graves, Ph.D.
Princeton University, 1946

This thesis is an examination into the war-time program for the enforcement of orders and regulations issued by the War Production Board and lies in the general field of the relations between government and business. The period 1942-1944 was selected because it was during those three important years that the Board was created and the compliance function developed and eventually declined.

The manner in which the Board has faced the problems of enforcing those priorities, limitation and conservation orders and regulations issued in its name, and the peculiar legal ramifications and effects of these administrative edicts, was considered of sufficient importance to justify an extensive description and analysis of the Board's enforcement operations. The compliance program basically was created to assure that the policies of the Board, as embodied in its orders would be observed by those "under the law."

Compliance authorities utilized three principal techniques of enforcement, all of which ultimately

relied upon the time-worn police investigation. Sanctions of an administrative nature were available to the Board and were applied only after fair hearings in cases brought by the legal authorities before compliance commissioners, who were appointees of the Board Chairman. Civil and criminal proceedings were instituted by the Department of Justice at the request of the General Counsel in extreme cases of noncompliance.

The Compliance Division, charged with general responsibility for preventing violations of orders and regulations, operated with a small headquarters staff in Washington and a large field organization attached to the regional district offices. Services of investigators from other Federal agencies, on a reimbursable basis, were utilized for compliance surveys and audits of Controlled Materials Plan operations.

This division was constantly in dispute with the General Counsel, the industry divisions and the field offices of the Board because of its insistence that it had authority over the entire compliance function. A thorough analysis of the situation has demonstrated that the approach of the Compliance Division was essentially detrimental rather than helpful to the attainment of the basic objectives of the war production program.

The Office of the General Counsel created the legal doctrine that the President's authority to allocate materials when they became scarce and were needed for the national defense, contained the power to withhold such materials from improper uses. As a result an elaborate system of enforcement was gradually established that was eventually approved by the Supreme Court.

The War Production Board early discontinued the practice of its predecessor, the Office of Production Management, that stressed educating business and industry that compliance was essential to a well-balanced production program. The Board assumed that orders and regulations must be obeyed and that ignorance of them was inexcusable. Investigations, surveys and audits disclosed, time after time, an honest ignorance of the binding regulations in a large percentage of cases.

In those extremely unusual cases where large producers were in serious violation, the very highest officials of the Board effected a solution without regard to the normal compliance procedures.

The general patriotism and honesty of American corporate management matched that of the American public in World War II. Lack of incentive to violate resulted in confining compliance action to the relatively smaller producers. What, then, was missing in the compliance program was an educational approach based on the theory that information, not coercion, was needed.

The lessons for the future in this experience with government regulation of business in time of war have immediate and far distant implications - organizationally, administratively and legally.

It is the major contention of this thesis that the compliance effort of the War Production Board was never properly organized or administered and that

it was exercised in a manner inconsistent with the basic objectives of a war supply agency.

Microfilm copy of complete manuscript of 284 pages, \$3.55. Enlargements 6" x 8", 10¢ per page.

A HUNDRED YEARS OF HONG KONG

(Publication No. 2973)

Stanley Dzu-fang Ho, Ph.D.
Princeton University, 1946

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EXECUTIVE WARFARE AND THE AMERICAS

(Publication No. 2995)

William Kahn Leonhart, Ph.D.
Princeton University, 1943

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THE INFLUENCE OF WESTERN POLITICAL THOUGHT UPON CHINA

(Publication No. 2997)

Channing Liem, Ph.D.
Princeton University, 1946

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Microfilm copy of complete manuscript of 242 pages, \$3.03. Enlargements 6" x 8", 10¢ per page.

GROUP INTERESTS IN AMERICAN RELATIONS WITH JAPAN

(Publication No. 3005)

John Wesley Masland, Jr., Ph.D.
Princeton University, 1938

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Microfilm copy of complete manuscript of 403 pages, \$5.04. Enlargements 6" x 8", 10¢ per page.

REORGANIZATION OF THE LABOR DEPARTMENT

(Publication No. 3657)

Francis Edward Rourke, Ph.D.
University of Minnesota, 1952

"Reorganization of the Labor Department" is a study of the administrative problems and political

conflicts centered around the reorganization of this national executive agency. The questions to which the thesis addresses itself include: (1) what administrative issues are posed by reorganizational proposals affecting a clientele agency? (2) what political assets or liabilities accrue to a clientele agency as a result of its identification with a particular population group? (3) what factors in the development of the Labor Department differentiate the department's reorganization problem from that of other clientele agencies?

This study traces the development of the Labor Department from its origin as the Bureau of Labor in 1884, through its establishment as an executive agency in 1913, to the present time. It examines the genesis of the department in organized labor's demands for equality of status with other interest groups and for representation and influence in executive policy-making. The implications of the scope and character of the department's mandate "to foster, promote, and develop the welfare of the wage earners of the United States" include the fact that the clientele concerned, though large, was vaguely defined, not a self-conscious interest, and subject to the additional weakness that its membership overlapped within the jurisdiction of other government agencies. Consequently, the department became heavily dependent upon the trade union organizations for its continued existence and development.

However, the alliance thus established between the department and the trade unions tended to defeat the purposes for which it was forged, since the department's ambitions for administrative expansion and organized labor's aspirations for influential representation in the cabinet both suffered from the identification between the department and organized labor. A further departmental weakness resulted from the holding company function it performed throughout much of its history that required the department to administer activities unrelated to its major purposes. The discharge of this function distracted the department from the fulfillment of a vital role in the formulation and administration of national labor policy.

The disjunction between the potential scope of the department's authority as outlined in its organic act and the actual extent of its jurisdiction throughout its history is a central concern of this thesis. Resistance to any expansion or clarification of the department's authority sprang chiefly from (1) employer conviction of the department's bias in favor of wage earners and its subjection to trade union domination, and (2) the opposition of business groups to any increase in the political power of organized labor. The support of the department by the trade unions was considerably vitiated by (1) the early political weaknesses of labor organizations; (2) the cleavages within organized labor; (3) the low priority given by the trade unions to support of the department's jurisdictional claims. With the great expansion of labor administration that came after 1933, labor functions were, therefore, increasingly

delegated to agencies outside the department. This development was later supplemented by executive and legislative action that removed from the department agencies long under its jurisdiction. Consequently, successive reorganization plans saw a progressive decrease in the department's administrative status.

The recommendations of the Hoover Commission which, as adopted, assign to the department substantial authority over labor administration, mark a significant turning point in the department's history. Questions central to the future course of the department's administrative development are (1) the manner in which the increased administrative substance of the department will influence its relationships with organized labor, and (2) whether the department's increased responsibilities will enable it to refute traditional charges of its administrative bias and incompetence.

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ALCOHOLIC BEVERAGE CONTROL IN NEW JERSEY

(Publication No. 3055)

Kuo-Ying Tsai, Ph.D.
Princeton University, 1946

Seven years of experimentation with state liquor control since Repeal in 1933 have not yet produced a completely satisfactory answer to the liquor problem. An examination of the liquor control system of New Jersey is attempted in order to evaluate the effectiveness of present regulating measures and to recommend possible improvements.

Effective operation of a state liquor control system depends on the proper combination of intelligent public policy and effective administration. The legislative intent of the law as originally enacted, and the subsequent changes in the New Jersey statutes have been studied in detail. The statutes laid down the policy of the state, which expressed the desires of the public in broad outline and provided the foundation for efficient administration.

In New Jersey, liquor control is divided into three parts:

1. Taxation under the Alcoholic Beverage Tax Division of the State Tax Department,
2. Overall regulatory control under the Department of Alcoholic Beverage Control,
3. Local regulation under the local liquor control authority established by the individual municipality.

There has been little friction between the Tax Department and the Department of Alcoholic Beverage Control. In the matter of licensing and control, the Department of Alcoholic Beverage Control is responsible for issuance of state licenses and for the over-all supervision of the whole system. The local liquor authorities issue the retail licenses and are responsible for the enforcement of the regulation of retail sales in their respective localities.

The home-rule prerogative dictated the system whereby local authorities have primary control of the retail liquor traffic. Diversified local sentiments, however, make difficult the State task of insuring uniformity of standards. Furthermore, local enforcement varies to extremes. The system may be remedied by granting the Department the power to issue all licenses and the responsibility of state-wide enforcement. An alternative is that the existing Department should be provided with sufficient personnel to enforce a uniform policy throughout the State.

The Legislature originally delegated to the Department broad powers to cope with the post-Repeal conditions. The manner in which this legislative intent is expressed makes the law subject to grave criticism, however, in that:

1. It places the office of the Commissioner under undue political pressure; and
2. It tends to undermine the principles of public service by failing to place enforcement personnel, such as inspectors and investigators, under civil service.

The appointment of the first Commissioner, the late D. Frederick Burnett, was fortuitous. Despite the weakness in the law, he placed the Department on a non-political basis, and developed and pioneered techniques of liquor control.

The regulatory measures developed by the Department and supplemented by local ordinances are very elaborate and extensive. The licenses, the manner of sale, and the conduct of the premises are all subjects of the regulatory control. The practice of fair-trade and restriction over discriminatory prices are outstanding accomplishments in the economic control.

It is the pronounced legislative policy that the taxation of liquor is primarily for control rather than for revenue. Experience over seven years has revealed that the liquor tax, in addition to being effective control device, has also brought increasing and steady funds to the State Treasury. The method of collection of liquor tax, the tax rate and the tax administration are founded on sound principles.

Proper enforcement of the law and the regulations is the final test of a control system. In this survey, there are found answers to the basic questions and problems relating to quasi-legislative and quasi-judicial actions, disciplinary proceedings, techniques of appellate jurisdiction and treatment of illicit activities.

In general, the conclusion is drawn that any analysis of the control exercised over the liquor industry has a significance which transcends the subject of alcoholic beverage itself. Government control over all economic activities is increasing. It is obvious that much can be learned by both government and business from what has taken place in the rigidly controlled and comprehensively regulated liquor industry.

It is indeed doubtful that there is, or ever can be, a system of alcoholic beverage control perfect in both its legislative and administrative aspects. In the main, New Jersey's control system appears sound and well suited to the State's circumstances and the

welfare and desires of its citizens. Should the recommendations made be followed, it is the writer's belief that alcoholic beverage control in New Jersey would come close to being a "model" among the several states.

Microfilm copy of complete manuscript of 245 pages, \$3.06. Enlargements 6" x 8", 10¢ per page.

PSYCHOLOGY

AN EVALUATION OF THE EFFECT ON PROGRESS IN THERAPY OF SIMILARITIES AND DIFFERENCES BETWEEN THE PERSONALITIES OF PATIENTS AND THEIR THERAPISTS

(Publication No. 3604)

Joseph Axelrod, Ph.D.
New York University, 1952

This investigation attempted to determine, by means of psychological tests, whether there is a relationship between patient-therapist personalities and progress in psychotherapy. It was basically hypothesized that patients who are more similar in personality to their therapists would be more likely to progress than those who are less similar to their therapists.

The population was drawn from the outpatient Mental Hygiene Clinic, New York Regional Office, Veterans Administration. It consisted of ten staff psychiatrists and forty of their psychoneurotic patients - twenty improved and twenty unimproved - each psychiatrist selecting his two most improved and two least improved patients. Steps were taken to test the objectivity of the psychiatrists' selections. The patients were all World War II veterans.

Rorschachs were administered to all subjects, the patients being tested between the first and fifth therapy session. The Wechsler-Bellevue Intelligence scale was administered to patients only, in order to eliminate those subjects whose intelligence was below average.

To test the basic hypothesis, the following approaches were taken to the evaluation of the Rorschach data:

1. Three judges rated independently the patient's and therapists' records, with respect to twelve individual personality characteristics, on the basis of a seven point scale. The reliability of the judges' ratings was established and each improved and unimproved patient was then compared with his psychiatrist for individual characteristics.

2. A comparison was made between improved and unimproved patients and their psychiatrists in regard to all the characteristics combined.

3. The Rorschachs were evaluated on a "global" level. The three judges, without being limited to any specific frame of reference, determined, on the basis of the protocols, which two of each psychiatrist's

four patients were most like him and which two least. The reliability was again established and the frequency of agreement between the number of "similar" records and "improved" records was computed.

4. Each individual Rorschach protocol was analyzed on a qualitative basis in order to determine the typical way in which the subject functioned. Three characterological categories were utilized as frames of reference.

The results obtained within the limitations of the fourfold approach to the data were:

1. Among the individual characteristics, ideation proved to be a statistically significant factor, to that extent affirming the hypothesis that similar patient-therapist personality characteristics are positively related to therapeutic progress.

2. Of the remaining characteristics, three - flexibility, breadth of interests, and intelligence - were not significant but were considered of sufficient statistical magnitude to indicate a trend in the direction of substantiating the hypothesis.

3. When all characteristics were combined, a statistically significant result was also obtained. Although there was an additive element in this specific approach, it did support the apparent trend of the other findings.

4. The "global" evaluation showed only chance agreement between "similar" records and "improved" records. Without discounting the negative aspects of the result, one possible explanation of the fact was offered. It was maintained that, since the judges had no frame of reference within which to judge the protocols for "global" similarity, they may have used one or two variables as criteria, and that these factors may not have been crucial to therapeutic progress.

5. The qualitative analysis revealed that psychiatrists who belonged primarily to the third characterological category - i.e., who were orderly, controlled, precise, self-critical and apt to intellectualize - achieved success with patients who used similar reactions.

6. The prominence of intellectual factors in the positive results was construed as indicating that similarity of thought processes was conducive to successful therapeutic outcome, since this aided meaningful and effective communication. It was also suggested that ideation and language may reflect emotional referents which are not easily revealed.

Microfilm copy of complete manuscript of 148 pages, \$1.85. Enlargements 6" x 8", 10¢ per page.

QUANTITATIVE VARIATION OF INCENTIVE AND PERFORMANCE IN THE WHITE RAT

(Publication No. 2931)

Leo Paul Crespi, Ph.D.
Princeton University, 1942

This study embraces three specific inquiries under the scantily investigated systematic problem

of the relationship between magnitude of incentive and performance. (1) What is the relationship between magnitude of incentive and level of performance? (2) What is the relationship between magnitude of incentive and distribution of effort (gradients) within performance? (3) What are the effects of contrast variation of magnitude of incentive upon level of performance with (a) an upward shift of incentive-amount, and (b) a downward shift of incentive-amount?

As the aim was to investigate motivational factors as reflected in performance, learning influences were minimized as far as possible by the utilization of a simple situation, namely a 20 foot linear runway with time measurable at quarter sections.

Values of the independent variable, incentive-amount, were fourfold increments from a unit base consisting of a Purina pellet approximately 1/50th of a gram in weight. Six levels were employed: 0, 1, 4, 16, 64, and 256 units. Drive was carefully equalized for the different incentive-amount groups by feeding each rat individually up to a constant amount (depending upon weight) after each daily run. The experimental design embraced analysis of variance and small sample theory.

From the data of three experiments some of the major results and conclusions bearing upon the questions posed in this investigation are as follows:

Problem I:

1. For the performance period of an activity, namely a group of trials taken when learning changes are largely over, a flattened sigmoid curve obtains between incentive-amount measured logarithmically and level of performance (runway speed) measured arithmetically.
2. Differences in amount of incentive occasion substantial differences in level of performance not only in the performance period of an activity, but throughout the entire range of the learning period.
3. Within the performance period of an activity rats run significantly faster to no incentive at all than to a very small incentive.
4. Qualitative observations of behavior patterns indicative of frustration characteristically associated with receipt of very small incentives, when contrasted with the relative absence of such indicators upon receipt of larger amounts of incentive or none at all, suggest an interpretation of (3) in terms of a factor - frustration of whetted appetite.
5. The relationship found to hold between amount of incentive and level of performance (1), with drive held constant, indicates that experiments upon learning as inferred from performance are indeterminate without precise specification of amount of incentive employed.

Problem II:

1. In the early learning period of an activity as the amount of incentive is increased in successive groups the shape of the speed-of-locomotion gradient changes from positively accelerated, through linear, to negatively accelerated. This result

controverts an expectation implied by Hull that increasing the amount of incentive in a linear runway would displace a linear speed-of-locomotion gradient upward and increase its slope.

2. Within the learning period of an activity under spaced trial conditions, as the amount of incentive is increased in successive groups the shape of the locomotion time graphs changes from a slight positive acceleration through strong negative acceleration to near flatness. This refutes Drew's contention that a Hull type gradient (negatively accelerated locomotion time graph) is only found under massed trial conditions and that it cannot be found under spaced trial conditions.

3. Comparison of the locomotion time graphs of the early learning period with those of the performance period indicates the effect of practice to be as follows: (a) for small incentives most of the improvement is localized in the middle sectors. (b) For medium and large incentives most of the improvement is localized in the first sector. These results refute Drew's contention that improvement in total score is a generalized function under spaced trial conditions.

Problem III:

1. Both fourfold and sixteen-fold upward shifts in amount of incentive occasion significant "elation" effects. That is to say, the levels of performance of these groups shifted from a smaller amount of incentive to a larger become significantly superior to the level of performance manifested by rats receiving the larger amount of incentive who have not had the prior adaptation to a smaller amount.
2. Both fourfold and sixteen-fold downward shifts in amount of incentive occasion significant "depression" effects. That is to say, the levels of performance of these groups shifted from a larger amount of incentive to a smaller amount become significantly inferior to the level of performance manifested by rats receiving the smaller amount of incentive who have not had the prior adaptation to a larger amount.
3. Qualitative observations of the reactions of the rat to downward shift in amount of incentive suggest that the depression effect is a quantitative manifestation of some degree of frustration.
4. The elation and depression effects are taken as an experimental basis for defining a variable within the rat which may be termed on the basis of human analogy an "expectation."
5. The elation and depression effects associated with quantitative expectations, coupled with the phenomena associated with qualitative expectation argue, in the opinion of the writer, for a two factor theory of incentive value. Incentive value is profitably viewed as proportional to the signed distance between level of expectation (both of quantity and level of attainment). The attainment of amounts of incentive and qualities below the level of expectation is frustrating in proportion to the degree of negative deviation; the attainment of amounts and qualities above the level of expectation is elating in proportion to the degree of positive deviation.

6. This level of expectation – level of attainment hypothesis has important disagreements with the following theories bearing upon the phenomena of changes of incentives and reinforcement. (a) The principle of expectancy as formulated by Hilgard and Marquis. (b) Bruce's notion of "habit-interference" in accounting for the effect of shifts in incentive qualities. (c) Hull's concept of the goal stimulus (s_g) as the hypothetical basis for the "realization of an anticipation." (d) White's completion hypothesis of reinforcement.

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THE RELATION OF DIFFERENT LEVELS AND KINDS OF MOTIVATION TO VARIABILITY OF BEHAVIOR

(Publication No. 3580)

Russell Lee DeValois, Ph.D.
University of Michigan, 1952

Animals faced with new situations in life depend for their survival upon exhibiting great variability of behavior, in order that the most appropriate response occur. On some occasions the requisite amount of variability does not occur. It is of fundamental importance to ascertain the particular conditions which lead to different amounts of behavioral variability.

The purpose of this dissertation was to test the following hypotheses:

- a. that with increasing intensities of motivation there will be decreasing amounts of behavioral variability, this being true for both approach and avoidance motives.
- b. if the intensity of motivation is increased, the amount of variability decreases.
- c. if the intensity of motivation is decreased, the amount of variability will increase, but the more intense the original strength of motivation, the longer it will be before the amount of variability increases.

Four groups of rats were run in a maze which had a number of equally long paths to the goal. The motivating conditions for the various groups were 6 hours thirst, 22 hours thirst, light shock, and strong shock. After 12 trials, 1 trial per day, the motivation of half of the animals within each group was changed to the other level within its type, e.g., light to strong shock. All of the animals were run for another 12 trials under these motivating conditions. The amount of variability during the 24 trial period was measured. On the 25th trial of the experiment a new, shorter path was made available to the animals, and the number of times each animal utilized one or more segments of this shorter path was noted.

It was found that: (a) the more highly motivated animals within each type of motivation were less variable than the less highly motivated animals, (b) increasing the strength of motivation leads to a

decreased amount of variability, (c) decreasing the strength of motivation leads to an increased amount of variability in the case of animals originally run on moderately high motivation (strong thirst), but not in the case of animals originally run on extremely high motivation (strong shock), and (d) the range of amounts of variability in avoidance animals overlaps with that of approach motivated animals.

These results are consonant with a theory that amount of variability is an inverse function of the intensity of motivation. This theory can also explain the experiments in the literature which relate to variability. The data do not support theories which state that invariable behavior is the result of avoidance motivation or of frustration, and variable behavior the result of approach motivation.

The data appear to permit the following conclusions:

1. High levels of motivation result in invariable behavior, and low levels of motivation in variable behavior.
2. There is no reason to postulate a dichotomy between variable and invariable animals.
3. The theory developed in this dissertation is supported by the results obtained herein and in the literature.

Microfilm copy of complete manuscript of 125 pages, \$1.56. Enlargements 6" x 8", 10¢ per page.

A STUDY OF THE RESPONSES TO SOUND OF NORMAL PIGEONS AND PIGEONS WITH ONE FISTULATED SEMICIRCULAR CANAL

(Publication No. 2939)

Donald Blynn Du Bois, Ph.D.
Princeton University, 1946

This paper is concerned with certain responses pigeons give to sound. These responses were discovered by Tullio, who found that normal pigeons gave a head tilting upward or downward to binaural stimulation and that pigeons with a fistulated canal gave a head nystagmus in the plane of the opened canal. Tullio demonstrated that the responses were mediated by the nonauditory labyrinth of the ear by showing that they persisted after removal of the cochleas.

Huizinga investigated the responses of operated animals and found that the greatest responses were given to frequencies between 400 and 1000 cycles. He offered a theory to explain why the operation caused the animals to give nystagmic responses to sound. This was that the opening created another "round window" in the labyrinth system and thus sound was able to affect the crista. He attributed to Tullio a theory which stated that the effect was caused by the operation making the crista more sensitive to sound currents in the labyrinth and did several experiments to show that this was not the case.

The present experimenter investigated three problems:

1. the general nature of the responses of both

normal and operated pigeons and the nature of change of the responses with time after operation,

2. the dependence on frequency of the responses of normal and operated animals, and

3. the effect of fistulation on the animals' responses to angular acceleration.

The results of the investigation of the problems showed:

1. that normal and operated pigeons do give responses to intense sound and that the responses of operated animals change in an orderly fashion with time after operation,

2. that the liminal "sensitivity curve" for both normal and operated animals is relatively flat and is found about 105 decibels above .0002 dynes per square centimeter,

3. that fistulation does not increase but actually decreases the sensitivity of animals to angular rotation. This is interpreted as being evidence that fistulation does not sensitize the cristae.

On the basis of the present experiment and the work of other investigators the possibility is suggested that certain responses animals give to sound may not be mediated by the hearing part of the ear. A consideration of these various responses shows that the startle response may be a non-auditory phenomenon.

Microfilm copy of complete manuscript of 33 pages, \$1.00. Enlargements 6" x 8", 10¢ per page.

AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN VISUAL PERCEPTION AND LEVEL OF PERSONAL SECURITY

(Publication No. 2964)

Philip K. Hastings, Ph.D.
Princeton University, 1951

Two separate investigations were undertaken in order to examine the hypothesis that a significant relationship exists between an individual's personality and his perception. Specifically, it was asked whether a person's general level of personal security influences where or how he visually perceives objects in the environment when the situation is such that the usual cues are either absent or in conflict. As a corollary to this query, it was suggested that there might be a relationship between an individual's level of personal security and where or how he perceives particular stimuli pre-selected as symbols of certain areas of human striving.

In both studies an adaptation of one of Adelbert Ames' demonstrations (the "oak leaf table") was employed as the basic piece of equipment. The stimulus objects were presented to the observer as projected images or pictures. A measure of personal security was obtained on all observers by means of The Knutson Personal Security Inventory.

In the first study, 16 subjects were randomly selected and asked to make five distance localizations on each of 25 stimulus objects. Following the perceptual phase of the experiment, the subject

filled out the personal security questionnaire. For each stimulus object, rank order correlations were derived between the subjects' mean distance localizations and their security scores. The rhos ranged from .50 through .80 with no apparent difference between the so-called value symbols and the more neutral stimuli. The correlations indicated that, in general, the more insecure an individual tended to be, the closer or smaller he tended to see all objects.

The second investigation was undertaken in an effort to provide answers to the following questions. First, will results similar to those of the first experiment be obtained using a larger population? Second, will there be a dichotomous performance perceptually if, from a large population, the high and low scoring groups on the criterion measure are pre-selected as observers? Third, will use of the interview technique be valuable in terms of reinforcing the results obtained from the pencil and paper questionnaire (the criterion measure) and for providing information as to the "why" of the particular perceptual performance? Fourth, is there a significant relationship between level of security and the amount of time it takes an individual to perform the perceptual task?

The Knutson Personal Security Inventory was administered to 76 university undergraduates, and from this population the 21 who scored highest and the 21 who scored lowest were selected as subjects. Each individual was asked to make 3 observations on each of 8 objects. The experimental session was terminated with an interview.

As in the first study, those individuals who were relatively insecure tended, by and large, to see the stimulus objects as nearer or smaller. Further, there was no apparent difference between the results elicited from the so-called value-symbol objects and those which were considered to be more neutral.

The results of the second investigation indicated no significant difference between the amount of time taken by the secure and insecure observers, as groups, to make the distance localizations. The information obtained in the interview proved, for the most part, to be consistent with that brought out in the questionnaire.

Although both studies seem to demonstrate rather clearly that a relationship exists between perception and personality, neither investigation provides any conclusive information as to the "why" or the function of the particular mode of perceiving. Hence, it is felt that it would be the better part of wisdom not to indulge at this juncture in what would of necessity be a purely speculative interpretation. The necessity for future research on this problem, probably carried out in conjunction with those trained in clinical and psychiatric work, becomes increasingly apparent in light of the results of these studies.

Microfilm copy of complete manuscript of 129 pages, \$1.61. Enlargements 6" x 8", 10¢ per page.

THE RELATIONSHIP OF INFORMATION AND OPINION TO AGE

(Publication No. 2970)

Robert Patton Hinshaw, Ph.D.
Princeton University, 1944

The present study is concerned with the relation of age to the psychological variables (1) liberalism-conservatism, (2) social and income class identification, and (3) knowledge of public and international affairs. Generalizations from previous researches have been limited because of the unrepresentative samples employed. An attempt was made in the present study to overcome this limitation by using data obtained by national polling organizations. One hundred questions were selected from the files of three of these organizations, the great majority being from the American Institute of Public Opinion (Gallup). Of the 100 questions, asked from 1937-1943, 79 were concerned with liberalism-conservatism, 2 with social and income class identification, and 19 with the knowledge of public and international affairs. Three age groups were used, a 'young' group, 18-30 years of age, a 'medium' group, 31-47, and an 'old' group, 48 years of age and older. Each of these three groups represents approximately a third of the population above 18 years of age according to the 1940 census returns. Breakdowns on the questions were made by age, by age and economic status, and by age and sex. The economic status groups used were an 'upper' and a 'lower', each representing about half of the population.

The principal results of the study are as follows: (1) In general, conservatism of opinion varies directly with increasing age. Greatest age differences are found in the field of morals and in certain miscellaneous values, such as the liking for 'swing music'. Significant differences are also found in the fields of anti-radical sentiment, government regulation, labor relations, racial prejudice, support of President Roosevelt, social security, and certain types of religious behavior. The upper economic half of the population is generally more conservative than the lower half. Exceptions occur in the field of morals and in race prejudice toward the Japanese and Chinese. Women are generally more conservative than men except in the field of race prejudice and on the issue of birth control. (2) The self-classification of individuals as liberal or as conservative tends to correspond to their discovered attitudes. Thus, most old people classify themselves as conservatives, while most young people classify themselves as liberals. Similarly, most people in the upper economic half and most women identify themselves as conservatives, and most people in the lower economic half and most men identify themselves as liberals. (3) The disparity of opinion between the upper and lower economic groups and the disparity of opinion between the sexes tend to vary directly with increasing age. This tendency is stronger between economic groups than between the sexes. Another way of stating this finding is that the young group is most homogeneous

and that heterogeneity of opinion increases with age. (4) Older people at the present time are generally more poorly informed in the field of public and international affairs than are young or medium aged people. It was also found that men at each age level are better informed than women, and that the upper economic group is much better informed than the lower economic group.

The problem of drawing conclusions from the data of the present study is complicated by the fact that the study is cross-sectional in character. Hence, age differences found may not, on the basis of the present study, be interpreted as changes of opinion in the older group. In other words, it is not possible to conclude that the older people have become more conservative with age. The results of the present study are equally compatible with the interpretation which regards the greater conservatism of the older group as being due to the fact that this group was reared in a more conservative era and has maintained its attitudes throughout life. Conclusions which can be drawn from the present study are, therefore, primarily statistical and descriptive rather than dynamic in nature, and are contained in the summary of results. The most certain predictive power of these generalizations lies in the present and the immediate future. Indications of their ultimate power to predict must await a more precise knowledge of the dynamics which produce age differences. This knowledge can come only from longitudinal studies. The present study may be considered as the first part of such a study.

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AN ANALYSIS OF THE VALENCE OF THE GROUP AND SOME RELATIONSHIPS TO INDIVIDUAL CHANGE

(Publication No. 3584)

David Hibbs Jenkins, Ph.D.
University of Michigan, 1952

This study is an attempt to develop a clearer understanding of the nature of the valence of a group for the person and of the relationships the valence of the group may have to the amount of learning or change which the individual makes in the group situation. In conceptualizing the meaning of group for the individual one can co-ordinate the group to one or more regions in the life space of the individual.

The group can be a source of initiating change within the person in two ways: (1) stimulation, in which the source of the forces to change in a particular direction is within the person, and (2) external induction, in which the source of the forces to change in a particular direction is perceived as external to the person. Under both of these conditions it was hypothesized that there would be a relationship between the valence of the group and change in the individual.

Two components of the valence of the group for the individual were examined in the data: (1) the generalized expectations for need satisfaction which the individual has for group situations or group experiences, called kind of valence, and (2) strength of valence, the resultant valence for the individuals of the qualities of a particular group situation. Data related to these two components of valence were secured in two different settings.

Persons who perceive groups primarily in terms of the goals of the group or as opportunities to learn tend to be duty-centered persons in their personality patterns as measured by the Runner-Seaver Personality Analysis test. Those who perceive groups primarily as places to enjoy people or to get support from them tend to be creative, individualistic persons. Individuals vary in the strength of valence which they attribute to a particular group experience, with those who indicate greater need satisfaction in the group attributing a greater strength of valence to the group.

In the two settings in which data were secured different patterns of personality were found associated with the greater strength of valence assigned to the particular group, indicating that the kind of group situation, as well as the needs of the person, must be considered in predicting the strength of valence which a particular group will have for the person. Although the data are somewhat inconclusive, a similar pattern of differences between the two settings was suggested in the relationship between kind of valence and the amount of change. Relationships between amount of change and strength of valence were not found to be significant.

The analyses and results of this study indicate that attention needs to be given to clarification of what being a member of a group means to the person, and the relationships of the needs of the person to those meanings.

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MUSCLE ACTION POTENTIALS PRODUCED IN VARIOUS WAYS AND THEIR RELATION TO QUANTITATIVE AND QUALITATIVE MEASURES OF ERGOGRAPHIC WORK

(Publication No. 3630)

Sherwin Jared Klein, Ph. D.
University of Pennsylvania, 1951

The objectives of the experiment were twofold: (1) To determine whether tensions, produced on the one hand by different rates of work and on the other by a report of success or failure, have the same relationship to work; and (2) To determine whether the relationship between tension and three measures of work depends upon the specific aspect of performance under examination.

The procedure was as follows: One hundred and twenty male subjects were asked to do an ergographic task, limited to sixteen excursions. Upon completion of the task, half of the subjects were given a report of success and the other half were given a report of failure. After a short rest, half of each of the above two groups was asked to work to exhaustion at a fast rate. The other half worked to exhaustion at a slow rate. Muscular tension levels were recorded throughout the routine for each subject. (Muscle action potentials were used as an index of tension.) The performance was measured during the initial and final task in three aspects; namely, accuracy, output, and variability.

The following conclusions derived from the experimental results were essential for the testing of the hypotheses: (1) An increase in rate of work was followed by an increase in tension. (2) Experimentally induced failure was followed by a resting tension level significantly higher than the resting tension level following experimentally induced success. (3) Experimentally induced failure preceding a task was followed by an increase in tension during the performance of that task while success was followed by a decrement in tension. (4) The simultaneous employment of failure and effort as independent variables in the final task produced a tension significantly higher than that produced by effort alone in the initial task. The simultaneous employment of effort and success as independent variables in the final task resulted in a lower tension than that produced by effort alone in the initial task.

The following conclusions derived from the experimental results bear directly on the hypotheses: (1) High tension was related to output regardless of how the tension was produced, when the initial tension and initial output were held constant. These findings held for tensions during the interpolated rest period and for tensions during the final work period. (2) High tension was related to high variability of work regardless of how the tension was produced, when the initial tension and initial variability were held constant. These findings held for tensions during interpolated rest and for tensions during final work. (3) Tensions during interpolated rest, regardless of how produced, were unrelated to accuracy of work in the final task when initial tension and initial accuracy were held constant. (4) High tension produced by a slow rate of work in the final task was related to poor accuracy of work when the initial accuracy and initial tension were held constant, irrespective of whether the subject succeeded or failed in the task. An opposite relationship was observed when tensions were produced by fast rate of work. (5) In general, the relationships between tension and output and tension and variability of work were similar whether the relationship studied was within the groups (correlations) or between the groups (analysis of variance).

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**AN ANALYSIS OF CERTAIN STRUCTURED AND
UNSTRUCTURED TEST RESULTS OF ACHIEVING
AND NONACHIEVING HIGH ABILITY
COLLEGE STUDENTS**

(Publication No. 3574)

Henry Hollinshead Morgan, Ph. D.
University of Minnesota, 1951

A group of male sophomore students of high scholastic aptitude was selected from the College of Science, Literature, and the Arts (SLA) of the University of Minnesota. These students, chosen on the basis of high scores on the American Council on Education Psychological Examination (ACE), were divided into groups according to honor point ratio earned during their freshman year in college. One group contained students who earned more than a B average during their freshman year; another contained students who earned grades below the average of all SLA freshmen. These groups were designated achievers and nonachievers respectively.

Fourteen hypotheses concerning interest, personality, and motivational variables of achieving and nonachieving high ability college students were tested by analyzing the results of certain structured and unstructured tests used to measure these variables. Interests were measured by the Strong Vocational Interest Blank; personality traits were measured by the Minnesota Multiphasic Personality Inventory (MMPI); and motivation was measured by a six picture version of the Thematic Apperception Test (TAT) and by a short series of semi-structured personal questions. In addition to the testing of hypotheses, comparisons were made to investigate other possible psychometric differences between the two groups.

Analysis of the results of the structured and unstructured tests indicated several nonintellectual factors or personality variables which were related to academic achievement. Variables which appear related positively to achievement are listed below.

1. Maturity and seriousness of interests.
2. Awareness of and concern for other persons.
3. A sense of responsibility.
4. Dominance, persuasiveness, and self-confidence.
5. Motivation to achieve, or the need for achievement.

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**A QUANTITATIVE STUDY OF EFFECTS OF PAST
EXPERIENCE ON ADAPTATION-LEVEL**

(Publication No. 3632)

Myrtle Corliss Nash, Ph. D.
Bryn Mawr College, 1950

The present study deals quantitatively with the effects of past and present stimuli on the judgment

of lifted weights. To determine the effect of past experience, the influence of previous stimulation at one intensity level on the judgment of later stimuli at a different intensity level was measured.

The rationale of this study is based on the theory of adaptation-level which grew out of the experimental work of Helson. This theory states that, when the organism is subjected to stimuli which vary in a specific dimension, judgments are based on the pooled effect (adaptation-level) of all stimuli present in a given situation as well as residuals of previous stimulation. Once the value of adaptation-level has been calculated, the judgments of particular stimuli can be predicted. This theory was found adequate for the data in the present study.

In the several experiments comprising this study, the total range of stimuli extended from 100 to 600 grms., spaced at 50 grm. intervals. The light background-stimulus weighed 90 grms.; the heavy, 900 grms. Stimuli were divided into sets of five each. The lightest set consisted of weights of 100, 150, 200, 250, and 300 grms.; the heaviest, of those of 400, 450, 500, 550, and 600 grms. Changes in the level of stimuli to be judged were of two kinds: gradual and abrupt. All changes were unidirectional, from light initial stimulation to heavy terminal stimulation or from heavy initial stimulation to light terminal stimulation. Each S was assigned to a group in such a way that he experienced changes in a single direction and of a single kind, by method of single stimuli at one session and with a background-stimulus at another session. Thus it was possible to compare the influence of previous experience with and without the background-stimulus for the same group of Ss.

Each group of subjects consisted of five people, drawn from a college population in a woman's college in which a few men from an adjacent college took courses. Since Tresselt's work suggests that these individuals comprise the same population in terms of remote past experience, no special measures to equate groups of subjects were taken.

Judgments were made in terms of qualitative categories ranging from very, very light to very, very heavy and translated into a numerical scale ranging from 10 for very, very light to 90 for very, very heavy. Results were treated in such a way that each value for *A* (adaptation-level) was based on 125 judgments, five judgments by five subjects on a set of five stimuli. All comparisons were made in terms of the values obtained for *A* under the various conditions.

On the basis of adaptation-level theory, the influence of early stimulation at one level of intensity should displace *A* toward the level of the earlier stimulation. The predicted displacement was clearly demonstrated for the method of single stimuli. It occurred less markedly with the less effective background-stimulus and in smaller degree with a very effective background-stimulus.

When a background-stimulus was used, *A* moved toward the level of the background-stimulus. The 900 background-stimulus raised the adaptation-level while the 90 lowered it. The effect is roughly

proportional to the difference between the background-stimulus and the series stimuli.

Detailed analysis of the experimental data shows that present stimuli are more effective than past stimuli, but both are simultaneously effective when stimuli are so chosen that the effect of one does not mask the other.

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A COMPARISON OF METHODS USED IN ATTITUDE RESEARCH

(Publication No. 3027)

Britten Littell Riker, Ph. D.
Princeton University, 1943

Within the realm of social psychology, the field of attitude measurement has expanded considerably in recent years. A consideration of present-day methodology in attitude research reveals that many different techniques of measurement are in use. The fundamental question posed is: Do these theoretically different techniques of attitude measurement yield different concrete results?

Before going into this problem it is important by way of introduction to consider the general problem of measuring the opinion of groups. The initial requirement in attitude measurement is a simple but comprehensive technique of eliciting opinions. The attitude scale is seen as a method which satisfies this requirement, and which is capable of ordering attitude data for objective analysis and quantitative treatment.

A consideration of the scales now in use reveals that there are two chief methods of scale construction. The first method is termed the empirical technique. Here the units which comprise the scale are experimentally determined by using well-established psychophysical methodology. The second technique is the logical method. The scale categories of the logical scale are not derived empirically, but are assigned arbitrarily by the experimenter. Since logical scale construction does not require the great expenditure of time and effort that attends the construction of an empirical scale, logical scales are popular in attitude research, although very little data have been presented in the literature which compare the results obtained by the two methods.

The present research was conducted to make a more systematic appraisal of various scaling methods, to provide a wider setting than previously reported, and to make a deeper analysis of the problems attending the use of various scales in attitude measurement. Toward these ends three scales embodying the logical and empirical approaches were employed in a study of six social issues.

It was hoped that this breadth of inquiry might

give a comprehensive answer to the basic question that was posed as the object of this investigation.

From the evidence presented in this study, the conclusion follows that substantially equivalent results are obtained from the employment of empirical and logical methods. This evidence has been gained by means of two analytical approaches to the problem; first through the analysis of the distribution of responses obtained upon the comparison scales, and second through an analysis of the correlations obtained among the responses given upon the measures.

Distribution analysis indicated that the two types of scales are similar in range and limits, and that representative units of empirical scales are equivalent to the categories of logical scales. Correlation analysis demonstrated that the similarity of the distribution derives from the individuals' making similar scores on the two types of scales. The extent to which the scores correlated was limited by errors of measurement found to attend the metrics.

From a consideration of the findings indicated by this joint analysis, the conclusion is drawn that empirical and logical scales yield results which are essentially the same.

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A STUDY OF THE NO OPINION VOTE IN PUBLIC OPINION POLLS

(Publication No. 3036)

William Donald Rugg, Ph. D.
Princeton University, 1941

Abstract not available.

Microfilm copy of complete manuscript of 129 pages, \$1.61. Enlargements 6" x 8", 10¢ per page.

AN INVESTIGATION INTO THE NATURE OF READING DISABILITY

(Publication No. 3552)

Audrey Ethel Snyder, Ph. D.
University of Michigan, 1952

Since a variety of auditory and visual factors involved in the reading process have been studied as sources of reading disability, this research was designed to test such factors through a wide range. It was planned to test the levels of sensation, recognition, recall and association. These factors were to be related to both neurological and learning theory insofar as possible.

S. T. Orton's theory, holding that lack of unilateral dominance of the angular gyrus region causes reading disability, was used to predict the kinds of behavior which would differentiate the groups of good from poor readers, and various learning theories and neurological postulates were considered in connection with the results.

Fifteen good and fifteen poor readers, matched for intelligence on the Wechsler Intelligence Scale for Children and for age to within six months, were given a series of tests which included: (1) visual recognition, (2) auditory recognition, (3) visual recall, (4) auditory recall, (5) visual association, (6) auditory association, (7) auditory to visual association, (8) handedness, (9) eyedness and (10) footedness.

It was predicted, according to the theory that mixed dominance of the angular gyrus region causes reading disability, that the functions largely served by this region should differentiate the two groups, and that they should also differ in the degree of mixed dominance in the measurable motor skills, since this has been widely used to predict mixed dominance of the language centers. The experimental and control subjects would be expected to differ in visual recognition and recall, in association involving visual stimuli, and in the degree of mixed dominance.

The results of the testing showed that the groups did not differ significantly in recognition and recall of either visual or auditory stimuli, (and for this reason no testing of the level of sensation was attempted). They also did not differ significantly in degree of mixed dominance as measured by handedness, eyedness and footedness. They did differ significantly, however, on all three of the tests involving associations.

Since the groups were originally matched for intelligence, but differed in their capacity for this particular kind of learning which involved making new associations, it was concluded that a learning theory which could explain these results would have to encompass at least two separable factors.

The source or sources of the difficulties in association remain to be investigated. Further investigation should also seek to determine how widespread the associative difficulties may be.

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SOME EFFECTS OF PERCEIVED PRIMARY GROUP PRESSURES ON ATTITUDES TOWARD A NATIONAL ISSUE

(Publication No. 3554)

Ivan Dale Steiner, Ph. D.
University of Michigan, 1952

On the basis of studies conducted by other researchers, it was postulated that individuals tend to experience a conscious motivation to avoid deviations from the attitudes of their primary groups. It was predicted that among persons whose own attitudes deviated from the attitude which the primary group was perceived to hold, the magnitude of such deviations would vary inversely with the strength of conscious motivations to conform.

Again, on the basis of studies conducted by other researchers, it was postulated that the above relation-

ship would not be entirely the result of autistic perceptions of the primary group's attitude. Therefore it was predicted that, among persons who saw their primary group's attitude toward an issue as being more "pro" than their own, the mean attitude of persons for whom conformity motivations were strong would be more "pro" than the mean attitude of persons for whom those motivations were weak. A parallel prediction was made for persons who saw their primary group's attitude as being more "con" than their own.

As a derivation from probability theory, it was predicted that members of a large population are more likely to see their primary groups' attitudes as lying in a direction which is toward the mean population attitude than to see those attitudes as lying in the direction away from the population mean. Therefore it was predicted that persons on whom conscious conformity motivations are strong would tend to hold attitudes which deviate less from the mean population attitude than do the attitudes of persons on whom such motivations are weak. Specifically, it was hypothesized that the standard deviation of the attitudes of a "strong motivation" category of persons would be smaller than the standard deviation of the attitudes of a "weak motivation" category.

The above predictions were tested by data obtained from a sample of 278 adults who responded to a questionnaire. This sample, though not representative of the national population with respect to the usual demographic criteria, was heterogeneous with respect to occupation, age, sex, and education. The data provided by these persons included a self-rating of their attitude toward the big business issue, a measurement of the strength of conscious conformity motivations, and an indication of the individual's perception of the modal attitude (toward big business) of his ten closest friends. On the basis of these data, four out of five of the above predictions were supported by differences which reached at least the .02 level of statistical significance. The fifth prediction was supported by differences which reached the .20 level.

Two supporting hypotheses were confirmed by data supplied by a national survey of attitudes toward big business. These data provided differences which reached the .02 level of statistical significance.

Some implications and limitations of this study are also discussed.

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PSYCHOLOGY, PATHOLOGICAL

REGISTRATION, RECALL, AND RELEARNING
IN PARESIS, CEREBRAL ARTERIOSCLEROSIS
AND KORSAKOFF SYNDROME

(Publication No. 3603)

Joseph Sheldon Herrington, Ph. D.
University of Pennsylvania, 1952

It was the purpose of the study to investigate rote learning and retention in individuals with the following diagnoses: paresis, psychosis with cerebral arteriosclerosis, and Korsakoff syndrome. It was hypothesized that a group of normal controls would learn a list of seven four letter words in fewer trials than the patient experimental group, that they would recall more of the words after an interpolated interval, and that they would relearn the list to the original criterion in fewer trials. It was further hypothesized that the subgroups of the experimental group would not differ from one another significantly on learning, recall, and relearning.

The experimental group included ten male veteran patients of each of the following diagnostic groups: paresis, psychosis with cerebral arteriosclerosis, and Korsakoff syndrome. There was a control group of thirty subjects equated with the experimental group on the variables of age, education, occupational status, and vocabulary score. The procedure consisted in having the subjects memorize a list of seven four letter words. There was an interpolated period of thirty minutes which was spent answering questions of personal information and general orientation, taking the Wechsler Bellevue vocabulary, being exposed to an interpolated list of ten four letter words, and answering questions of general information. After the interpolated period recall of the original list was asked for; this was followed by the relearning of the list to the original criterion.

The results obtained supported the hypothesis that the experimental group would manifest a deficit in initial learning and in relearning; however, the hypothesis that they would also show a recall deficit was not entirely supported. An examination of the subgroup data cast some light on this seeming disparity between the findings of this experiment and that of Hull. The controls differed from both the Korsakoff subgroup and the cerebral arteriosclerotic subgroup, but there was not a significant difference between the controls and the paretic subgroup. This rather strongly suggests that in the case of recall among patients with organic brain disease great care must be taken in making any generalizations from limited samples. The very poor recall performance of the Korsakoff subgroup is of interest in view of Wechsler's finding that this group manifested a deficit at the "fixation stage" of the memorial process.

It can be concluded from the correlational data that recall did not have the same relation to learning and relearning in the experimental group that it did in the control group. It was also found that

there was less stability of correct responses in the experimental group. It is suggested that further study of recall and of the general class of phenomena known as reminiscence may lead to a better understanding of memory deficit in pathological conditions.

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A PSYCHOMETRIC STUDY OF DIFFUSE AND
FOCAL CEREBRAL PATHOLOGY GROUPS

(Publication No. 3415)

Elizabeth Ann Mee, Ph. D.
University of Minnesota, 1952

The primary purpose of the research was to determine whether there is a psychometrically analyzable variable in the diffuse-focal continuum of cerebral brain damage. The diffuse and focal groups were arbitrarily designated according to the consensus of neurology textbooks as to whether the individual case was diffuse or focal pathology.

Cases (N=92) were obtained from the Fort Snelling Veterans Administration Hospital. The site of the focal lesions was verified by surgery, X-ray, or post mortem. The cases in the two original groups of 26 each were psychometrically matched for "laterality" and for "caudality," and approximately matched for education, occupations, and marital status. It was impossible to match them for age as diffuse processes more generally occur in older age groups and the focal cases included gunshot wounds from recent wars, hence denoting the younger age groups.

The Minnesota Multiphasic Personality Inventory and the Wechsler-Bellevue Intelligence Scale, Form II were the test instruments used.

From analysis of the MMPI data, no statistically significant differences were found either between group means computed on the T-scores of each scale or between rank means based on codes. From item analysis a Diffuse-Focal scale was developed which separated the original groups with only 4 per cent misses, but upon cross validation with 27 cases the percentage of misses rose to 37 per cent. Therefore it was concluded that the MMPI did not sufficiently discriminate between the diffuse and focal cerebral pathology groups to be of clinical usefulness.

The Wechsler-Bellevue did not discriminate between the two groups when the subtests were used individually, but when analyzed pattern-wise, an index was derived which correctly classified 74 per cent of the total of 42 cross-validation cases. Five per cent were unclassified.

From inspection of the final Diffuse-Focal Index the following conclusions were drawn:

1. The most potent factor in the index was the subtest Comprehension, which is more efficient in discriminating when used in combination with other subtests of diffuse-focal sensitivity. Since this is directly related to confusion it was shown that

confusion, as might be expected, is greater with diffuse cerebral pathology than with focal cerebral pathology.

2. Patients with diffuse cerebral damage show the greatest loss with recent memory and comparatively little, if any, loss with remote memory.

3. Power tests appear to be far more discriminating with these groups than do time tests.

As a minor problem it was shown that both the Wechsler Mental Deterioration Quotient and the Reynell Index were shown to be inadequate in detecting cerebral brain damage. It is suggested that the reason for this inadequacy lies in the tacit assumption made in the use of both instruments that brain damage, regardless of the type, is a homogeneous factor, whereas the results of this paper seem to indicate that there is a diffuse-focal dimension, which can be detected psychometrically.

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A STUDY OF THE RELATIONSHIP BETWEEN MOTIVATION AND TEST PERFORMANCE OF PATIENTS IN A REHABILITATION WARD

(Publication No. 3436)

Mary Frances Myatt, Ph.D.
University of Minnesota, 1952

This research project was instituted at the Veterans Administration Hospital, Fort Snelling, Minnesota, to determine whether the psychologist with four widely used psychological testing instruments can predict the amount of motivation that a patient will evince on a rehabilitation ward. The total sample included 262 cases, but all patients could not take all tests. Testing instruments used were the Minnesota Multiphasic Personality Inventory, the Porteus Maze Test, the Bender-Gestalt, and the Rorschach. The criterion adopted was ratings of motivation made by permanent members of the staff who saw patients daily in a therapeutic setting. Correlations between the ratings of the staff ranged from .78 to .93. Statistical devices employed were analysis of variance followed by t-tests between groups in any significant categories, the "U" statistic, and Chi-square tests by both a nine-fold and a six-fold table.

Major conclusions are:

1. Although motivation was not adequately measured by any of the test instruments used, some interesting trends were noted.

a. Patients rated as having low motivation have higher mean T-scores on the majority of the scales of the MMPI than do patients rated as having high motivation, but within group variance prevented a difference of as high as 10 T-score points from achieving statistical significance in the present small sample. A Low-High scale was formed from 36 items found

significant at the .05 level which separated the original group with 6 percent misses, but with the cross-validation group percent of misses rose to 42.

b. The two non-verbal tests, the Porteus Maze and the Bender-Gestalt, more nearly approached statistical significance than did the MMPI and Rorschach. The non-verbal tests are valuable in a setting where disabilities are so varied because fewer limitations are placed upon the type of patient who can take them.

c. One scoring category of the Rorschach, the ratio of responses on Cards VIII, IX, and X to total responses, separated the high group from the low group both by the t-test of significance of difference between means and by the "U" statistic for identity of distributions. Using an optimum cutting score, 17 percent of the original group and 35 percent of the cross-validation group were missed.

2. Lack of purity of groups may have interfered with attaining statistically significant results. The number of cases in the high and low groups permitted only separation of cases with known cerebral pathology from cases without known cerebral pathology. Although patients with dominant cerebral lesions perform differently from those with non-dominant cerebral lesions, no separation was made as to hemisphere; nor was there separation along the fronto-caudal continuum. Range of severity of disability was wide.

The group without known cerebral pathology included several etiological categories, none of which could be treated as a separate group because of the lack of sufficient number of cases.

There was no separation as to age, socioeconomic status, intelligence, and education.

3. More accurate predictions can be made about those patients without cerebral pathology than about those with cerebral pathology.

4. It is possible that the problem of motivation is more related to subtle performance factors than to the personality factors reflected in the testing instruments employed. It is suggested that for future studies of motivation a more complex, mechanical apparatus be included to measure the level of frustration tolerance.

5. The use of a trial period during which the patient is closely observed and judged according to statements which have been statistically scaled as applying to motivation might yield a more valid prediction than any single testing instrument.

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RELIGION

THE THEOLOGY OF LOVE IN
CONTEMPORARY PROTESTANTISM

(Publication No. 3327)

Anthony Samuel Chadwick, Ph. D.
Columbia University, 1951

Although the centrality of love in the Christian life is disputed by none, its significance has become a subject of theological controversy, and its relevance to man's ethical and social life has thereby been obscured. The purpose of this thesis is to examine the dominant trends in contemporary theology and to seek an interpretation of Christian love which will do justice to its distinctive quality and religious depth without sacrificing its challenge to moral endeavour or its social dynamic.

The first part of the thesis contrasts the interpretations of Christian love set forth by Liberal and Neo-orthodox theology, taking William Adams Brown and Albert C. Knudson as representative of the former, and Emil Brunner and Reinhold Niebuhr as representative of the latter. Liberal Theology stresses the centrality of love in the Christian life, and believes it to be an immediate possibility for the individual and an ultimate possibility for society. Christian "agape" is equated with brotherly love or universal benevolence, and the Christian's social task is defined as the establishing of the Kingdom of God upon earth by making love the basis of all human relationships. Neo-orthodox Theology challenges these assumptions, emphasizes the rigoristic element in the Gospel ethic, and the complete dependence of sinful man upon Divine grace. Christian love is set in contrast to natural benevolence and the "Kingdom of God" is never man's achievement but God's gift.

The religious source of "agape" in fellowship with God is discussed on the basis of a critique of *Agape and Eros*, the work of the Swedish theologian Anders Nygren which is regarded by many as the definitive Protestant treatise on the subject. The Lundensian school occupies an extreme anti-Liberal position, and Nygren believes that Agape is not human love at all, but Divine love which flows through man as through a pipe. He regards all human love as a form of self-love, and maintains that love towards God is an intrusion in the Christian tradition from the alien sphere of Hellenistic "Eros." It is urged against Nygren that, although God's love is universal, it is not indifferent to moral worth or to man's responsive love, and can only be understood against the background of His righteousness and judgment. Man's love for God arises from need, but is not therefore inevitably egocentric, as it is characterized by the elements of thanksgiving, adoration, and obedience, and it is in adoration and worship that the Christian affirms the true Centre of his life in God.

The third part discusses the ethical life of the Christian. His love for his neighbour is not an infusion from without but it has its origin in a

religious experience which sets both himself and his neighbour in a new relationship, freeing him from egocentricity and anxiety so that he may freely serve the needs of his neighbour. Although Agape "seeketh not its own" it knows how to receive as well as to give and aims at a mutuality of self-giving. The conflicting claims of many neighbours set limits upon what one can do, and although Christian duty demands an equality of love, it yet imposes an inequality of responsibility according to one's special vocation. The Christian's social responsibility cannot be expressed in terms of an eternal or natural law, for the only "law" that is permanently valid is the imperative of love. Nor can the "order" of justice be sharply separated from the "order" of love, for love must seek justice in order to fulfill its responsibility to many neighbours. Yet love remains in tension with justice, refining its standards, providing a dynamic for its achievement, judging its shortcomings, and transcending it in its own redemptive and sacrificial dimensions.

The fourth part sets out the interpretation of love to which the discussion has led and discusses the possibilities of achieving the Christian ideal both in personal and social life. Although perfection in love can never be claimed, it remains the ideal criterion of Christian conduct and the inspiration of all endeavours to achieve a more just social order. Progress in the latter sphere must inevitably be slow and costly, but the Christian is sustained in his task by the conviction that he does not rest upon his own limited resources but upon the Divine love which was supremely manifested upon the Cross.

Microfilm copy of complete manuscript of 298 pages, \$3.73. Enlargements 6" x 8", 10¢ per page.

SOCIOLOGY

COLLABORATION, RESISTANCE, AND
LIBERATION: A STUDY OF SOCIETY AND
EDUCATION IN LEYTE, THE PHILIPPINES,
UNDER JAPANESE OCCUPATION

(Publication No. 3358)

Elmer Norton Lear, Ph.D.
Columbia University, 1951

This study aims to present a documented analysis of the life of a community under enemy rule. The community, Leyte, was the object of direct study by the present writer during his two years' sojourn in the Philippines.

Several hundred interviews, taking in people of all social strata and occupational pursuits, were conducted. The interviewees were of two categories: those who had lived in the Japanese-dominated zones of Leyte, and those who had lived in the guerrilla-controlled zones. The data thus gathered was verified on the basis of internal consistency, cross-reference, compatibility with a wide assortment of documentary

materials, and personal observation. The documents referred to consist of guerrilla military papers, guerrilla civil papers, documents of the "puppet" provincial and municipal administrations, private memoirs and records, documents of the Japanese Military Administration, Philippine governmental reports, and American war literature dealing with Leyte.

The study introduces Leyte to the general reader with a brief demographic description, including some notes on Philippine governmental structure and a sketch of the Island's history. It then focuses attention upon the status of Leyte's defenses and the morale of its population during the very critical months between the outbreak of the Japanese "sneak attack" and the Island's capitulation in May of 1942.

Chapter II concerns itself with the governing policy and activities of the Japanese Military Administration in Leyte, and the adaptation of the Filipino "puppet" administration and the people to enemy occupation.

The impact of Japanese dominion upon local agriculture and commerce is examined with a view to showing the predatory nature of that dominion. The methods by which the Japanese sought to adapt the local administration to their purposes by a system of indirect rule are also studied. Attention is directed to the Japanese program of thought control through the establishment of a "culture-front" organization, a "neighborhood association," direct censorship over the media of communication, control of education, and indirect domination of institutionalized religion. The so-called pacification program and the active campaigning in behalf of Philippine "independence" are also reviewed with an appraisal of their effectiveness. A disquisition on the nature of collaborationism, with specific reference to Leyte, is incorporated in this chapter.

Chapter III, the analysis of the resistance movement in Leyte, constitutes the heart of the study. The chapter has three main themes. First, in tracing the origin and growth of guerrilla organization, the chapter attempts to account for the failure of guerrilla unification in terms of power-hunger, mutual suspicion, the confusion of liaison with the Allied command, and the absence of a common ideological cement. Secondly, the pattern of military rule within the guerrilla zone is delineated so as to reveal the advantages of consultative arrangements between guerrilla military and civilian leadership.

Thirdly, it is shown that the mobilization of communal resources by a resistance movement, professedly non-revolutionary in character, may involve a subversion of vested proprietary rights.

This central chapter seeks to illustrate these themes by training its binoculars upon nine municipalities of Leyte. In them, it sees the forces operative throughout the guerrilla zone converging upon the affairs of the Filipino population in its home communities. It also attempts to indicate the agencies at work within the unoccupied portions of Leyte educating the people to resist both the intimidational pressure and the blandishments of the collaborationist regime.

The study carries over into the Liberation period, tracing the aftermath of resistance and collaboration, and pointing up the difficulties of reconstruction. Particular emphasis is placed upon the role of education in the building of a better post-war society, with some of the deficiencies of prevailing educational practice duly noted. The study concludes with a consideration of American acculturative influences upon Filipino life and a summary of trends.

Microfilm copy of complete manuscript of 745 pages, \$9.31. Enlargements 6" x 8", 10¢ per page.

RELIGION AND PERSONAL ADJUSTMENT IN OLD AGE: A STUDY OF SOME ASPECTS OF THE CHRISTIAN RELIGION IN RELATION TO PERSONAL ADJUSTMENT OF THE AGED IN INSTITUTIONS

(Publication No. 3638)

David Oscar Moberg, Ph.D.
University of Minnesota, 1952

This study deals with the analysis of the personal adjustment of 219 persons aged 65 and over at the nearest birthday who were residents of seven institutions in the Twin City Metropolitan Area.

Personal adjustment was measured by the Attitudes Inventory of YOUR ACTIVITIES AND ATTITUDES by Burgess, Cavan, and Havighurst (Science Research Associates, 1948).

To test the hypothesis that the religion and religious background of an individual are related to his personal adjustment in old age a series of ex post facto experimental designs were set up. Experimental and control groups were equated by the pairing of individuals so that matched persons in the control and experimental groups were alike with respect to as many control variables as possible, but different with respect to the aspect of religion which was the subject of the specific design. Each subsidiary hypothesis was then tested by the use of two null hypotheses dealing with observed differences in personal adjustment and the comparability of these differences to differences of a magnitude that could occur between randomly selected groups of the same size from the same universe.

Increasing precision of matching of church members with non-church members by the use of an increasing number of controls reduced the differences in personal adjustment of the two groups to such an extent that it was concluded for the sample studied that church membership in and of itself appears unrelated to personal adjustment in old age. Even the matching of church members with persons who did not indicate ever having been church members failed to reveal differences in personal adjustment that were statistically significant.

The product-moment correlation of a computed religious activities score with the personal adjustment score for the 219 subjects of this study was .4593. The matching of 19 persons with high religious

activities scores with 19 persons who had low scores yielded differences in personal adjustment that were highly significant, thus verifying the hypothesis for the sample studied that personal adjustment in old age is related to one's religious activities, the better-adjusted people being more active religiously.

The matching of 22 former church leaders with 22 persons who did not indicate ever having been church leaders resulted in statistically significant differences in personal adjustment in favor of the former leaders.

To test the hypothesis that religious beliefs are related to personal adjustment in old age a religious beliefs score was constructed on the basis of hopes for the future, reasons for praying, beliefs about sin and one's own sins, belief about the Bible, and belief about Jesus Christ. Persons who held most closely to orthodox or conservative Christian beliefs were called "believers," as contrasted to "non-believers" at the other end of the continuum. The product-moment correlation of the religious beliefs score with the personal adjustment score was $r = .462$. The matching of 22 "believers" with 22 "non-believers" disclosed significant differences in the personal adjustment scores verifying the hypothesis for this sample that religious "believers" are better adjusted in old age than "non-believers."

On the basis of the experimental designs and seven case studies included in the thesis it was concluded that religion is an important factor related to personal adjustment in old age, although it is only one of many factors which must be studied together to have an adequate picture of the configuration of factors that influence personal adjustment in old age.

Many suggestions for future research, possible interpretations of the findings, the questionnaire used in gathering the data, and a bibliography of 64 sources cited in the thesis are included.

Microfilm copy of complete manuscript of 171 pages, \$2.14. Enlargements 6" x 8", 10¢ per page.

SOCIAL FACTORS IN SOUTHERN WHITE EQUALITARIANISM

(Publication No. 3597)

Donald Edwin Rasmussen, Ph.D.
University of Illinois, 1952

White persons with equalitarian racial views may be viewed as social deviants in the American deep South with its racial order of Negro subordination and white superordination. The situations of these equalitarians in a social setting of racial inequality has a "logico-experimental" value for a scientific study of racial views in that the causes of the views of deviants may stand in clearer focus than the causes of more ordinary views. An investigation of the causes of equalitarianism may therefore have value for the more general problem of explaining racial ideologies and race relations.

Thus far sociologists have not studied the causes of equalitarian racial views in this type of racial situation.

Limited to the sociological approach and hypothesizing that social group affiliations are factors in causing racial views, social life histories and statements of racial ideologies were obtained from fifty white persons living in a single metropolitan area of the deep South. All of these persons were born and raised in the South. They were located through their reputations for being "liberal on the race question." Forty-six of them were actually "liberal" or appeared deviant enough in their attitudes to qualify as good cases for analysis. Data from the social life histories were classified and analysed under the following types of affiliations: families, neighborhoods and communities, schools, religious organizations, business and professional groups, worker groups and unions, informal associations and social circles of equalitarians, and affiliations with groups with Negro members.

As an exploratory effort, this study aimed to discover hypotheses as well as to gather data relevant to the specific hypothesis proposed. "Liberals" in the deep South were found to be much more numerous than was expected on the basis of reading literature about the region. All persons approached for data were cooperative in giving information about themselves. This cooperation was dependent upon a friendly, sympathetic approach to informants and a promise to them that any data about them would be kept anonymous. The racial ideologies expressed by the informants appeared to be better described under "varieties of patterns of thought" rather than as "variations in degree along a single continuum." A careful analysis of the roots of equalitarian thought seems dependent upon some classification of these patterns of thinking. Mannheim's types of utopian mentalities, namely, religious, liberal-humanitarian, conservative, and socialist-communist, appear suggestive for this purpose.

While the hypothesis of the study was limited to the sociological approach, it was inevitable that social psychological considerations were encountered in attempting to differentiate between the positive and negative effects of various social groups. The following social psychological process relating to the negative effect of social group norms on the individual was suggested by our data: Traditional, normal groups reject the individual, weaken in their control over him, or are inconsistent in their controls. The individual's reaction in any of these situations may be to reject specific group norms. Such rejection is rationalized by generalized concepts which in turn provide the basis for a redefinition of additional situations including situations of race relations. Thus an original breach between the individual and society on a specific issue spreads to additional issues and perhaps to a rejection of the social order.

All of our informants reflected in their racial views the norms of one or more groups with which they were affiliated. Most of these groups were informally organized. The relation of the views of informants and the norms of groups to which they

belonged varied and appeared to be classifiable under the following four processes: "born into groups with equalitarian traditions" as in the cases of persons influenced by equalitarian parents; "drifting into equalitarian groups" as in the cases of persons rejected by normal groups and happening to contact and to come under the influence of equalitarian groups; "Joining groups in which equalitarianism is a means to a group end" as in the cases of persons joining labor unions with Negro workers in order to promote better working conditions; and, "seeking groups with equalitarian ends" as in the cases of persons consciously joining interracial groups in order to propagate the ideology.

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SPEECH

THE USE OF THE DIARY AND SURVEY METHOD INVOLVING THE QUESTIONNAIRE-INTERVIEW TECHNIQUE TO DETERMINE THE IMPACT OF TELEVISION ON SCHOOL CHILDREN IN REGARD TO VIEWING HABITS AND FORMAL AND INFORMAL EDUCATION

(Publication No 3578)

Tom C. Battin, Ph.D.
University of Michigan, 1952

This study concerns itself with the development of a technique for measurement by which it might be possible to determine the role and importance of television in the lives of school children; to determine its impact on viewing habits and education, either formal or informal, and to examine the ways in which it may possibly be used constructively in the field of education.

To get a valid sample, all public and parochial schools in the city of Ann Arbor, Michigan, were contacted. A close check was made on children in grades 1 through 12 and those who had had television for 6 months or longer were given a 7-day diary in which to record all their televising for one week, Monday, November 13th, through Sunday, to November 20th, 1950.

The personal interview technique was used as a follow-up with all students, in grades 4 through 12, who had returned the diaries. These interviews required 5 weeks to complete, from January 8th to February 9th, 1951, and information was compiled relative to the impact of television on: subject matter studied, extra-curricular activities, reading habits, recreational habits, and program popularity.

The findings indicate:

1. 5703 students enrolled in the 15 public and parochial schools.
2. 33 per cent have TV sets, and of this number, 59 per cent have had them for 6 months or longer.
3. 76.5 per cent returned the completed diaries.

4. The weekly televising average is 18 1/2 hours in grades 1 through 6 and 21 hours in grades 7 through 12.

5. In all grades children set up well-defined time patterns of televising.

6. Children have fairly well-balanced diet in their TV program preferences.

7. Children indicated how TV programs have helped them in specific subjects.

8. High schools boys and girls reveal televising does not interfere with week-end dates, dances, movies, parties, etc.

9. Reading is stimulated by TV program content.

10. The majority of children observe a regular mealtime and bedtime hour.

11. Children do want variety of content in their books, movies, radio and television programs.

12. Length of set ownership is one of the most salient factors in determining televising habits of children.

13. At least 1 per cent of the children televised 207 of the available 385 programs telecast.

14. Television has taught children worthwhile activities.

15. Children want more educational programs if they are well-written, adequately produced, and skillfully enacted.

16. 90 per cent viewed with other persons present.

17. Televising does not replace activities within the home or outside the home.

The general conclusion is that children, after having TV sets for 6 months or longer, form definite time patterns of televising, as well as, definite habits of program selection. They do not let televising interfere with their formal and informal education.

Microfilm copy of complete manuscript of 318 pages, \$3.98. Enlargements 6" x 8", 10¢ per page.

IMITATION OF INTONATION PATTERNS

(Publication No. 3593)

Allan Cooper Goodman, Ph.D.
University of Michigan, 1952

This is an experimental evaluation of the roles of frequency, intensity and duration in the imitation of English intonation patterns. It tests the hypothesis that in affecting judgments of goodness of imitation, certain portions of a phrase exert greater influence than others, and that such portions are likely to be either the first or last portions of a phrase, or the portions receiving primary or secondary stress.

Twenty subjects were asked to imitate the manner in which five phrases were spoken, and the imitations were rated subjectively as to their goodness by seven panels of listeners representing varied speech and language specialties. The frequency, time and intensity characteristics of the originals and the imitations were then compared to provide a basis for objective ratings representing

the degree of correspondence of the imitations to the originals with respect to each of these physical characteristics. Regression coefficients were computed as a measure of the relationship between the objective and the subjective ratings, and the differences between the phrase portions were evaluated using the regression coefficients as scores in variance analyses.

The results indicate that with respect to frequency and duration, accuracy of imitation of the physical characteristics varies in its effect on subjective ratings depending upon the phrase portion involved. The phrase portions which appear most important in influencing the ratings are those receiving primary or secondary stress. Further findings indicate that intensity characteristics are imitated with consistently high accuracy, and that judge groups representing different speech and language specialties do not differ in their sensitivity to accuracy of imitation of the physical characteristics.

The primary conclusions are that accurate imitation of the frequency or duration characteristics of certain portions of a phrase exert greater influence than other portions on subjective ratings of the goodness of imitation of the entire phrase, and that these portions are the ones receiving primary or secondary stress.

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ZOOLOGY

A SYSTEMATIC STUDY OF THE AVIAN FAMILY FRINGILLIDAE, BASED ON THE STRUCTURE OF THE SKULL

(Publication No. 3556)

Harrison Bruce Tordoff, Ph.D.
University of Michigan, 1952

The relationships of the avian family Fringillidae, order Passeriformes, based primarily on the structure of the skull, and especially of the bony palate, are the subject of this report.

Most recent authors have recognized five subfamilies of the Fringillidae; Carduelinae, Richmondinae, Geospizinae, Emberizinae, and

Fringillinae. The present study indicates that the Carduelinae should be removed from the Fringillidae, since they differ from the remaining four subfamilies as follows: the Carduelinae lack palato-maxillary bones in the palate, have flared prepalatine bars, and have fused mediopalatine processes. Furthermore, they differ in the proportions of the major limb bones, in geographic distribution, and in various behavioristic traits.

Most of the characters of the Carduelinae which distinguish the subfamily from the rest of the Fringillidae are shared, at least in part, with the weaver-finches of the subfamily Estrildinae, family Ploceidae. It is concluded that the carduelines actually are advanced ploceids, and should be placed in that family near the Estrildinae.

The Fringillinae, Geospizinae, and Emberizinae can be included in a single subfamily, the Fringillinae. The Richmondinae merge with the tanagers, family Thraupidae, through such genera as *Saltator* and *Piranga*. The Fringillinae also merge with the tanagers, but through *Chlorospingus*, *Phrygilus*, *Arremonops*, and their allies. Because the tanagers grade into the finches, the former are included in the Fringillidae as a separate subfamily, the Thraupinae.

In the author's opinion, the Fringillidae have served as the central stock from which the other New World nine-primaried Oscines have developed. This opinion is based on inference drawn from the function of the palato-maxillaries, which are of wide occurrence in the New World nine-primaried Oscines. It is thought that palato-maxillaries were present in the ancestral stock of the New World nine-primaried Oscines and that they served as adaptations for a diet of seeds or other hard foods. With this premise as a starting point, a possible evolutionary path has been traced for the major divisions of the Fringillidae (*sensu stricto*). The recent distribution of the genera which are judged to be primitive on morphological grounds corresponds closely with the distribution expected if Matthew's hypothesis concerning the causes and methods of dispersal of animal groups is correct.

On the basis of these primarily morphological studies, a classification of the finches and their allies is proposed which differs from those in current use.

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DISSERTATION ABSTRACTS

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